

# PUBLIC WORKS

**Dec.**  
**1960**

**CITY, COUNTY AND STATE**

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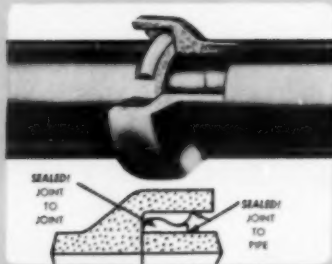
Richard Hazen, a partner in the firm of Hazen and Sawyer, consulting engineers, New York City, specializes in the problems of water supply, treatment and waste water disposal. See page 18.

## PUBLIC HEALTH BEGINS AT CITY HALL



*Sanitation, a vital element, but . . .*

### Sewer System *only as good as* House Connections



Inferior quality house connections to sewer mains pull the big line, however well designed, back to inferior level. Infiltration in small lines discharges excessive ground water into the main, taxing its capacity . . . Wedge-Lock® Clay Pipe helps cities beat this problem. . . . Four through six-inch diameter Wedge-Lock in house connections gives triple protection against infiltration, exfiltration and roots. Reduces load in sewerage. . . . Reduces plant pumping. . . . So safe, it can be used *under* basement floors. Conforms to ASTM Specifications C 425-58T, Type 1. Put it in your plumbing code.

\* Pat. T.M. Reg. U.S. Off.

WLC-480-7

## Wedge-Lock® CLAY PIPE

THE FACTORY-JOINTED CLAY PIPE AVAILABLE NATIONALLY FROM LOCAL MANUFACTURERS

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The Clay City Pipe Company..... Uhrichsville, Ohio  
Graff-Kittanning Clay Products..... Worthington, Pa.  
Larson Clay Pipe Company..... Detroit, Mich.  
Lehigh Sewer Pipe & Tile Company..... Fort Dodge, Ia.

The Logan Clay Products Company..... Logan, Ohio  
The Owensboro Sewer Pipe Company Owensboro, Ky.  
Pomona Terra-Cotta Company..... Greensboro, N. C.  
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**JUST OFF THE PRESS! BROCHURE DESCRIBING WEDGE-LOCK INSTALLATIONS. WRITE FOR FREE COPY!**

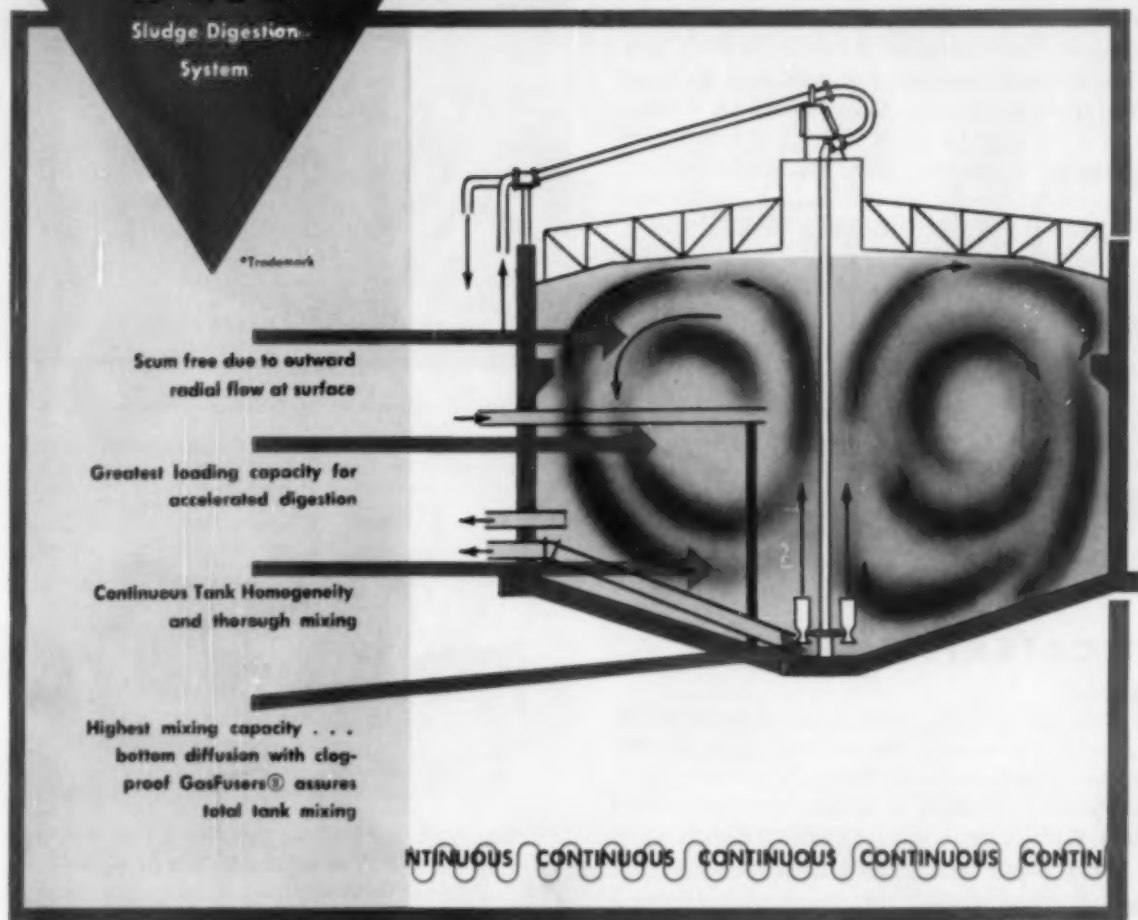
**"Chicago"** An available<sup>①</sup> means for  
increasing digester performance

Accelerated  
**CRP**

Sludge Digestion  
System

by insuring Homogeneous Sludge through

**CONTINUOUS MIXING**



① License under U. S. Patent No. 2777815  
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② "Gasfuser" Continuous Gas Recirculator

**55** operating and specified installations of the CRP<sup>®</sup> System  
with "Chicago" gas mixing equipment since 1955 prove its unparalleled acceptance...serving cities from 2000 to 250,000 population.



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*Putting Ideas to Work*

FOOD MACHINERY AND CHEMICAL CORPORATION  
HYDRODYNAMICS DIVISION

**CHICAGO PUMP**

622F DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

# LAND IMPROVEMENT

## IN LANE COUNTY, OREGON

Along the Oregon coast, Lane County's D6 cuts a road to the ocean for a new recreation area near Florence. Lane County, stretching from the Cascades to the Pacific, depends on its D6 and 18 other Caterpillar-built machines to carry out road maintenance and construction programs. Multimillion-dollar road programs, new state parks... these are the things being done in Lane County. County Road Engineer H. O. Walberg commented on their Cat-built equipment: "We're well satisfied with our Cat equipment for two big reasons... big production and little down time. And when we need dealer service, it's there! The D6 is particularly useful to us. It's small enough to work in tight places, but big enough to tackle tough jobs."

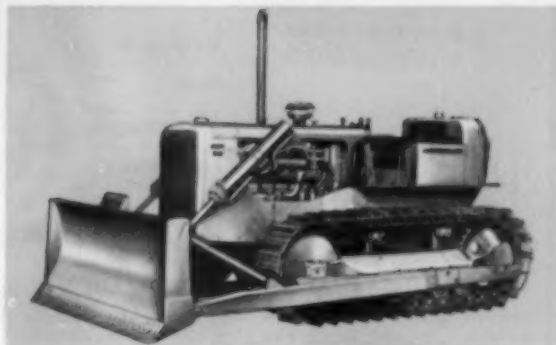


# MACHINE IMPROVEMENT

## BY CATERPILLAR

There's a new D6... the Series B... just introduced by Caterpillar. On the same jobs, on tougher jobs, this new work-styled D6B sets production peaks unheard of from a machine in its size class. It has more than just improvements... the all-new compact Caterpillar Diesel Engine, the D333, boosts lugging ability 25%. A new integral hydraulic system (optional) puts power where it's needed... at the tools. Center-pivoted cylinder mounting gives increased lift/drop range. Under-the-hood location of tank, pump and valves permits convenient routing of hydraulic lines to bulldozer or implement cylinders... frees the front and rear for working tools. The operator's cockpit is all new. Controls make the tractor handle almost as if it knew what was needed next.

The exclusive Caterpillar oil clutch is standard on the D6B. It provides up to 2,000 hours of adjustment-free operation. Lifetime lubricated rollers need no lubrication until rebuilding... help roll up more operating time instead of repairs. The dry-type air cleaner removes at least 99.8% of all dirt from intake air. Can be serviced



in five minutes. Cuts maintenance time by as much as 75%. Optional hydraulic track adjusters are another time saver. A grease gun is all that's needed to assure proper track adjustment.

Now's the time to see the new D6B and its complete line of versatile attachments. See for yourself how the new D6B gets more work for your tax dollars.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

# CATERPILLAR

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**BORN OF RESEARCH  
PROVED IN THE FIELD**

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ANDREW ADAMS			

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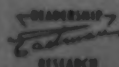
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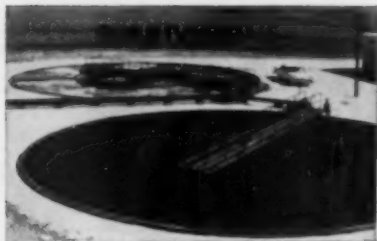


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# SPARJAIR COMPLETE SEWAGE TREATMENT PLANTS

## Designs for all Developments and Land Planning Projects



Hampton Pk. (Hsg. Devel.), Ill. - 1 mgd tot. cap.



Finn Trailer Ct., Ill. (365 units) - 45,500 gpd.



Hillcrest Shpg. Ctr., Joliet, Ill. - 50,000 gpd.

Sparjair units overcome previous objections to locating a plant near residences, shopping areas, schools, etc. Its new but proven principle of Contact Stabilization aerates and thoroughly oxidizes all odor producing wastes.

Nested design provides complete treatment equal to large municipal plants.

1. Permits development of outlying, low cost land.
2. Capacities from 50 to 5000 population equivalent.
3. Eliminates septic tanks and drain fields.
4. Virtually automatic—Simple operation.
5. Approved by Health Authorities.
6. Odor free — no septic or stale operations.

Details and layouts are available to Consulting Engineers and their Architects, concerned with the design of package sewage and water treatment plants. Write factory at P. O. Box 266, Aurora, Ill. for complete information.

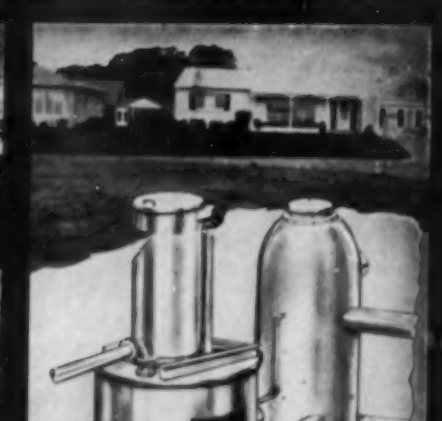
Walker Process also offers CLARIPURE Package Water Purification Plants—pre-designed capacities from 50 to 600 gpm.

**WALKER PROCESS EQUIPMENT INC.****FACTORY • ENGINEERING OFFICES  
LABORATORIES****AURORA, ILLINOIS**

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THIS IS THE STATION THAT IS PREFABRICATED AND DELIVERED



READY TO OPERATE

**A PACKAGED UNIT**—completely shop-fitted with quality components throughout. Transported to job site ready for installation.

**SIMPLIFIES LOCATION**—underground operation permits use of existing public property such as parkways, etc. Saves cost of surface property and enclosing structure.

**ECONOMICAL**—saves costs and time. Prefabrication results in lower construction costs and less time at job site. Simply set in place, connect and start up.

**ZF****ZIMMER & FRANCESCON**

COMPLETE DATA, SPECIFICATIONS AND DRAWINGS AVAILABLE—WRITE

P.O. BOX 359, MOLINE, ILLINOIS



### The Public Works Values in Our Cities

IT HAS BEEN estimated that the public works investment by a city in water supply, streets, waste disposal and other utilities is about equal to the private investment in other land and buildings. This may seem excessive to some, and the actual ratio will vary with the size and nature of the community. However, it is a rough scale by which may be judged the importance of municipal public works, the need for good management and the employment of modern equipment, materials and methods.

The increasing growth of suburban areas, as indicated by the recent census returns, and the probability of strip developments along our comprehensive high-speed highway system emphasize still further the necessity for more and more planning, management and good engineering.

### Designing for Air Pollution Control

THE ATMOSPHERE has a definite capacity to dilute and disperse contaminants, just as our streams have a capacity for oxidizing organic liquid wastes. The capacity of the air above us to handle pollution is affected by meteorological conditions, topography and other factors. These must be studied and evaluated as a first step toward intelligent regulation and control to maintain the atmosphere in a satisfactory condition. As in other pollutional control activities, prevention is far better than attempts at cure; therefore, gathering the necessary information on which to plan for the future should be an essential part of planned development for any community. With such data as a basis, control of future problems is infinitely easier.

### AASHO + BHIF = GO

WE NOTE with hearty approval the recent announcement that the American Association of State Highway Officials has endorsed the general objectives of the "good roads" campaign now being developed by the Better Highway Information Foundation. The Executive Committee of AASHO called on the individual state highway departments to cooperate with road building industry's public service educational program.

This kind of cooperation is not only desirable but imperative if a clear and current understanding of

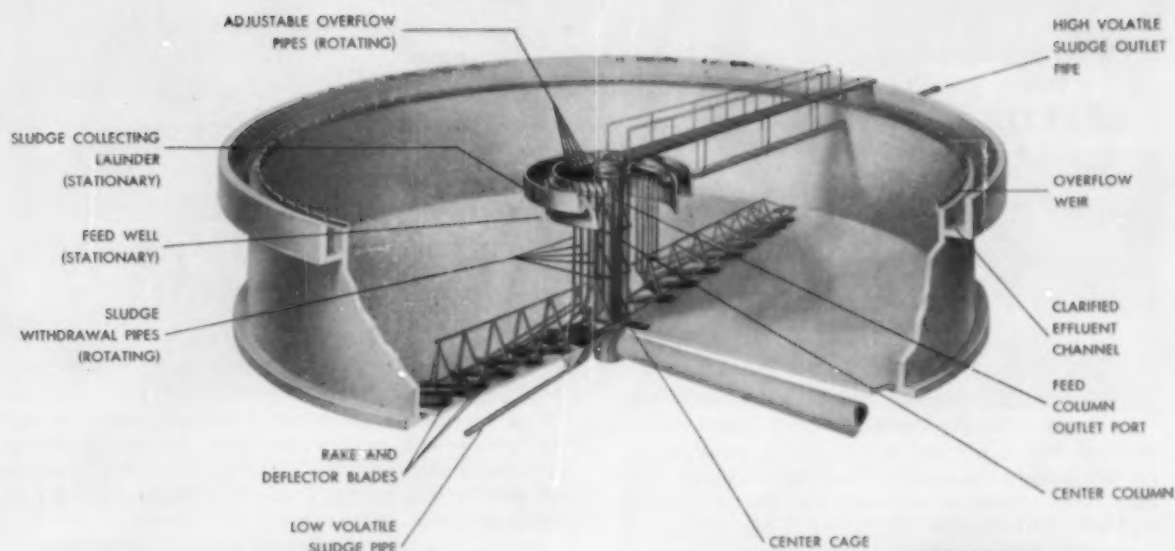
our highway needs and our highway program are to be presented to the citizens of the nation. If we have a program and a profession of which we can be proud—and we are convinced that we do—then the focus of public attention on an accurate picture of this vital program is our best insurance that it will succeed.

### Lagoons for Solid Wastes?

CONSIDERABLE success has been claimed for sewage treatment by the lagoon method. It is perhaps possible that the same principles can be applied to the disposal of solid wastes. The organic load of garbage is about the same per person as that in sewage. If so, and if the basic principles governing oxidation are the same, a new method of refuse disposal may be possible. Some data are available from England where it has been found that nuisance does not develop in colder waters and that aeration or chlorination is also useful in inhibiting odor production.

### The President's Call to Confer on Water Pollution

THE NATIONAL Water Pollution Conference to be held in Washington, December 12 to 14, could easily be mistaken by many as a convention-type affair, where most of the attendants are listeners or nonworking participants. This conference is being held in compliance with the wishes of the President, stated in his message to Congress vetoing a measure to increase Federal aid for construction of sewage treatment plants. Because it was felt that an increase in construction grants may not be the best answer, the meeting has been called to review the entire problem of water pollution, its nature and the resources available for correction. It is hoped that the opinions expressed will crystallize into guide lines for policy making and action taking by Congress and the governmental agencies. The attendance-by-invitation approach is a good way to assemble a cross section of persons capable of presenting informed opinions. It would be a sad commentary on our profession if a national policy were to be based on the expressions of a vocal handful in an assembly of 1,000, so if you plan to be there, also plan to make your presence felt. And this means preparation in advance, including an orderly arrangement of your ideas and the reasoning on which they are based.



3-WAY CAPABILITY of the RSR Clarifier to make high-volatile sludge, low-volatile sludge and clarified effluent separation is illustrated in the cutaway drawing.



VISUAL EVIDENCE of sludge flow as it enters the collecting launder. Note in particular the flexibility provided for varying sludge flow from each individual uptake pipe.

## NOW... *Rapid,* *continuous sludge removal* *with the new* **DORR RSR CLARIFIER**

For rapid removal of fresh sludge on a continuous basis, the Dorr® RSR Clarifier affords visual evidence of quality and quantity of sludge removed from secondary clarifiers. This is accomplished by removal of sludge from the entire floor area by rotating uptake pipes. Simple adjustment provides for controlled rate of sludge removal from each individual pipe.

In operation, a combination of rake and deflector blades channel the fresh sludge to an area under the

withdrawal pipes where the sludge is lifted by hydraulic head to the collecting launder. Sludge flows from the launder to a sump for recycling or wasting following conventional practice. The sweeping action of the rake blades also provides for removal of grit and other inorganic material without dewatering the tank.

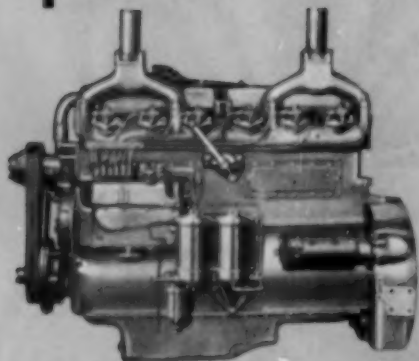
For information on the RSR Clarifier and on the complete line of Dorr-Oliver equipment and methods for sewage treatment, write Dorr-Oliver Incorporated, Stamford, Conn.



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WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

# Township cuts costs with all-job International power



International UD-554  
diesel 6-cylinder,  
4-cycle engine

"Our International-powered Galion motor grader keeps busy building roads, cleaning ditches, plowing snow, etc., plus ordinary road maintenance. It handles all jobs at minimum cost. No overhaul or major repairs needed in 6,800 hours of engine operation."

—Tom Roth, Road Commissioner

**Outstanding performance** of International engines plus dependable low-cost operation on heavy-duty road machinery is a matter of record the world over.

**Faster payback** on original investment permits write-off long before useful life is exhausted. Trouble-free performance of International engines on graders, rollers, sweepers, cranes and standby power adds thousands of hours of operation to every machine.

**Better performance** can be expected of International-powered equipment because of the dependable long-life engine, thus stretching tax dollars.

**A wide selection** of heavy-duty power is offered in the International line. Choose from 35 engines—16.8 to 385 max. hp—gasoline, LP gas, natural gas or diesel. This wide selection lets you match the power to the job, and gives you the many advantages of power standardization.

**See your International Engine Distributor or Dealer** the next time you need power for your construction machinery, generators, pumps, or auxiliary units. He'll be glad to help you solve your power problems.

## INTERNATIONAL<sup>®</sup> H. ENGINES

International Harvester Co.,  
180 North Michigan Ave., Chicago 1, Ill.  
A COMPLETE POWER PACKAGE







# WILL PERFORM FOR A CENTURY WITH A RIVER ON ITS BACK

At left, you see a length of cast iron pipe being installed under the Floyd River in Iowa. This is part of a water feeder main which will reinforce the existing water supply system.

Despite the severe conditions of a river overhead, the inherent ruggedness of cast iron pipe promises at least a century of trouble-free performance, and rarely requires repairs or replacement.

And cast iron pipe's cement lining assures a continued full flow of water year after year. It's no wonder that more than 90% of the pipe used for water supply systems in our 50 largest cities is cast iron pipe!

CAST IRON PIPE RESEARCH ASSOCIATION,  
Thos. F. Wolfe, Managing Director,  
3440 Prudential Plaza, Chicago 1, Illinois



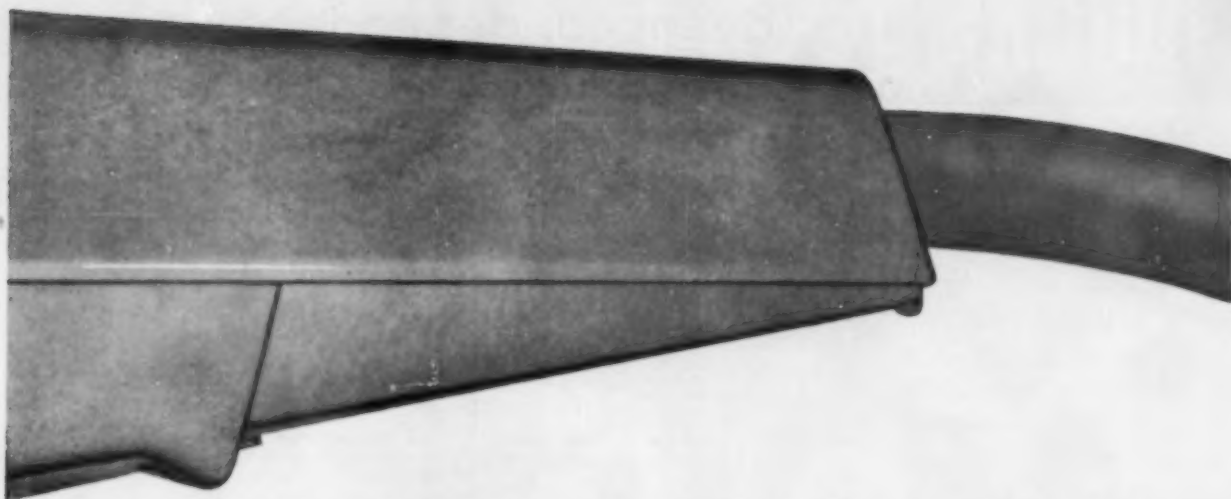
## CAST IRON PIPE

THE MARK OF THE 100-YEAR PIPE

*New from Westinghouse*



high intensity  
OV-50 mercury  
luminaire  
distributes more  
light over  
wide roadways



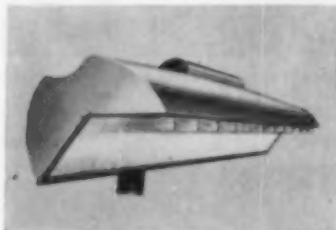
You need high-level lighting where traffic is heavier and faster and roadways are wider. Here's why the new Westinghouse OV-50 mercury luminaire is your best bet.

This good-looking unit, with external ballast, takes 700- and 1000-watt mercury lamps, clear or color improved. Boosting illumination intensities can be just a matter of changing lamps. And you get more light because a scientifically designed optical system directs a major portion of this extra light to the roadway surface where it is needed most.

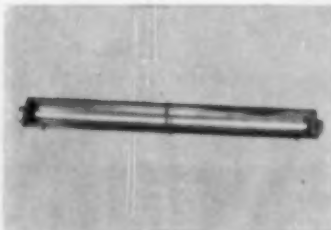
Maintenance is minimized, too. With the new OV-50, the optical system is completely sealed—no dust, moisture or bugs can get inside. The die-cast aluminum housing has an attractive "hammer-tone" silver aluminum, baked enamel finish that's highly resistant to heat, abrasion and corrosion. The OV-50 fits standard poles and brackets, or davit poles with a minimum 7½-inch pipe tenon. Find out more about the OV-50 with either internal or external ballast. Contact your nearby Westinghouse representative or write Westinghouse Lighting Division, Edgewater Park, Cleveland, Ohio. Remember—you can be sure . . . if it's Westinghouse.

J-04478

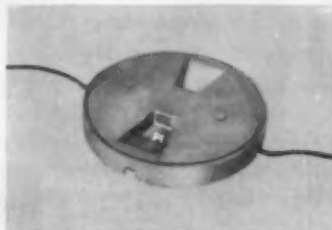
**Westinghouse**



**NEW WESTINGHOUSE FAN-COOLED, FOUR-LAMP "MAINSTREETER"** gives you the benefits, prestige of fluorescent roadway lighting . . . economically. Designed to be located at the curb and mounted parallel to it, the trim "Mainstreeter" keeps dangerous glare out of drivers' eyes. Four fluorescent lamps, coupled with special reflector and refractor, mean more light more uniformly distributed (coefficient of utilization is often as much as 50% higher). A cooling system is thermostatically controlled to provide lamp cooling when needed.



**NEW WESTINGHOUSE SIGN-PAK:** Roadway directional signs, competing with adjacent illumination, must stand out if fast-moving drivers are to get the message. Answer: the exclusive Westinghouse Sign-Pak, incorporating two high-efficiency Sataliner reflector assemblies; in-line ballast compartments (with ballast); and extra-long leads. Completely prewired, preassembled for easy installation. And since Sign-Pak directs light upward from the sign bottom, the light can't bother drivers.



**NEW WESTINGHOUSE RUNWAY LIGHT:** Westinghouse makes a complete line of airport lighting and control equipment. This latest addition is the new inset light which solves the approach and landing problem of the jet-age aircraft. Utilizing a small, 45-watt quartz-iodine lamp, this rugged, disc-shaped unit mounts flush to, or no more than ¼ inch above, the runway surface. Result: safer jet landings because of the nonblinding strips of light, visible under all weather conditions.

# ROILINE

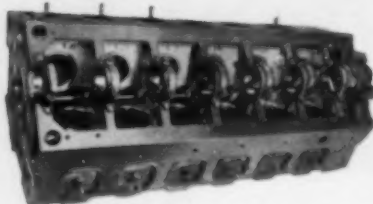
## GAS ENGINES

are advanced, dependable, and proven in Municipal Service.

In-line 6, V-8, or V-12 cyls.—up to 706 hp.

### HEAVY DUTY... LONG LIFE

A look inside these engines reveals the rugged construction that can be relied upon for dependable service.



Internally ribbed crankcase gives solid crankshaft support. Extra rear main bearing absorbs side thrust.



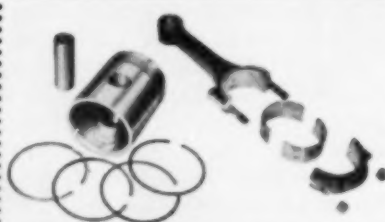
Large diameter, short in length, the rugged counterbalanced crankshaft handles power without vibration. It has generous bearing areas.

### MORE POWER... BETTER ECONOMY

These ROILINE engines are the most modern, most powerful natural gas-butane-gasoline engines in their class.



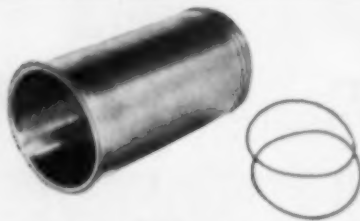
The "Easy Flow" manifold design provides perfect fuel and air distribution to all cylinders through large individual intake ports.



Aluminum pistons are taper cam ground. Full floating piston pins. Connecting rods have big wear-resisting replaceable bearings.

### EASY MAINTENANCE... QUICKLY SERVICED

All wearing parts have replaceable bearing surfaces. All routine maintenance points are readily accessible.



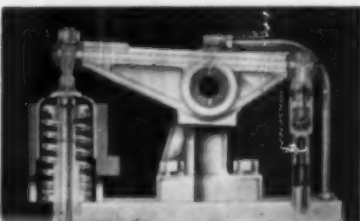
Long wearing cylinder sleeves are easily replaced and cost far less than reboring cylinder block and installing oversize parts.



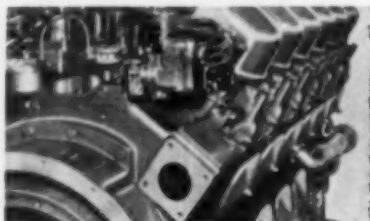
Cylinder heads can be removed by one man without disturbing manifold, carburetor, or controls. Note guided valve mechanism.

### SMOOTH—QUIET... CLEAN—COOL

Benefits from newest design features mean more comfortable operating conditions and easier maintenance.



Hydraulic "Zero-Lash" lifters eliminate noise and adjustments and extend valve life. Engines are practically vibration-free.



Exhaust manifold is water cooled and integrally cast into the crankcase to provide cooler operating area and fast warm-up of the engine.

499 Write for literature

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New York • Tulsa • Los Angeles  
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**Quiet, vibration-free mowing** at higher speeds is yours with the new International balanced head cutter bar mower.



**Cut a 10-foot swath** with combination of International rotary and cutter bar mowers. Use together or independently.



**Only a Cub tractor can do so much** for such a small investment! Above, equipped with 60-inch International Danco rotary.

## More mowing for your money

*at your IH tractor dealer*

From grooming neighborhood playgrounds to mowing miles of expressway median, today's public officials are faced with a complexity of mowing problems. Selecting the right equipment to meet these varied requirements can help stay within manpower and equipment budgets on the one hand, and favorably influence public opinion on the other through improved community appearance.

You can save hundreds of dollars, for example, if you specify an International® Cub instead of a larger tractor that can do no more on a multitude of small-area mowing jobs. At the other extreme, you cut high-mileage mowing costs to the bone when you use a 61 hp\* IH tractor with 94-inch, center-mounted rotary mower. Where fuel costs are important, specify 38, 47, and 61 horsepower Internationals with Diesel engine.

\*Maximum engine hp at standard conditions

**Ask your IH Dealer**—He'll gladly supply complete specifications covering the industry's widest range of tractor horsepower ratings, with matching cutter bar, rotary, and other types of mowers. See for yourself why you get the most for the money with Internationals!



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AFTER 12 YEARS



OF RESEARCH AND 45,000



OPEN-CLOSE TESTS, THE MUELLER • ORISEAL •

CURB VALVE HAS GONE TO WORK. AND ON THE JOB, AS IN

THE TESTS,



THE ORISEAL HAS PROVEN LEAKPROOF

IN SPITE OF REPEATED USE OR PROLONGED IDLENESS. THE

"TEFLON" \* COATED PLUG



RETAINS ALL ITS LUBRICATING

QUALITIES IN ALL CONDITIONS. EVEN THE 2" ORISEAL VALVE

IS OPERATED WITH JUST A 12" WRENCH—UNDER 125 P.S.I.



ONCE INSTALLED, THE ORISEAL SELDOM NEEDS ATTENTION—

THE LINE WILL PROBABLY BE REPLACED BEFORE THE ORISEAL

WILL REQUIRE SERVICING !



WRITE FOR MORE FACTS ON THE ORISEAL

CURB VALVE OR ASK YOUR MUELLER REPRESENTATIVE.

**NEW  
CURB BOX  
for the  
ORISEAL**

matches the Oriseal in  
rugged design and long-  
lasting quality.  
H-10385 for 3/4" and  
1" valves;  
H-10386 for 1 1/4", 1 1/2"  
and 2" valves.



**ORISEAL  
CURB VALVE**

Sizes 3/4", 1", 1 1/4", 1 1/2", 2"

H-10291—Inside I.P. Thread

Inlet and Outlet

H-15176—Mueller Copper

Service Pipe

Connection Inlet;

Inside I.P. Thread

Outlet

H-15201—Mueller Copper

Service Pipe

Connection Inlet

and Outlet

**MUELLER CO.  
DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles  
In Canada: Mueller, Limited, Sarnia, Ontario

\*DuPont Company registered trademark.

# LARGE GOVERNMENT FLEET FINDS BIG SAVINGS IN '61 LARK PERFORMABILITY

Here is convincing evidence that the '61 Lark can save you money. Four of the country's best-known companies (ranging from the food field to utilities and state governments) thoroughly field-tested the '61 Lark in their regular daily fleet operations prior to introduction.

Many different drivers tested each car, averaging 255 miles apiece at the wheel in their regular work—through city traffic, on high-speed turnpikes, in the mountains, even off-road driving. Results were certified by the United States Testing Company.

The New Skybolt Six engine of 112 HP showed 15.5% to 20.8% higher economy than last year's Six—with a 25% increase of power. Compared to known mileage figures of other cars, these test

results indicate superior economy for the '61 Lark—even with its improved acceleration and cruising characteristics!

Other economies to bear in mind are The Lark's high resale value, and fleet-documented savings of  $\frac{1}{2}$  on maintenance and repairs. All these advantages—with 22 fleet models to choose from—make Studebaker your smartest buy for official cars or pool cars in every department, from Public Health to Police.

Other Features of the '61 Lark include new suspension and steering (30% easier), new bonded brakes (up to 100% longer wear), smart low-line styling, safety-padded dash...over 50 improvements, all contributing to '61 Lark *Performability*.

You have to drive it to believe it!



THE

## '61 LARK

BY STUDEBAKER

### GET THE FULL STORY ON FLEET SAVINGS!

Fleet Sales Division, Studebaker-Packard Corporation, South Bend 37, Ind.

- ☐ Send us informative literature only
- ☐ Have a factory representative call me for an appointment
- ☐ Also send information on Studebaker truck savings

NAME PLEASE PRINT \_\_\_\_\_

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PW12-60 F3

## Public Works Officials in Many Cities, Counties, States and Provinces

MAKE BUDGET DOLLARS DO MORE WITH  
AIRPLACO CONCRETE GUNNING EQUIPMENT

When the Job Calls  
for Concrete . . . Call for



**AIRPLACO CONCRETE GUNS** for Restoration and Repair of Roads, Streets, Bridges, Culverts, etc. Choose from six different models in a complete line of concrete guns. Whatever your production requirements—from  $\frac{1}{2}$  to 8 cu. yds. per hour—there is an AIRPLACO BONDACITOR or NUCRETOR to meet your needs.

### AIRPLACO MIX-ELVATORS

for Faster, Easier Proportioning, Mixing, Elevating and Screening. Choose from three models. Capacity up to 12 yds. per hour.

### AIRPLACO GROUTER AND PLACER

for Easy-to-Use, Versatile Grouting and Placing of Concrete and Other Materials. The portable Model G-6 Grouter and CP-10 Placer is ideal for soil stabilization, tunnel backfilling, filling hard to get to forms, etc. Both the G-6 and CP-10 have capacities of up to 5 cu. yds. or more depending on materials used and job conditions.



**AIRPLACO JET-BLASTERS** For Low-Cost, Easy-to-Use Sandblasting (wet or dry). The Model B-6 single charge (650-lb. capacity) and B-3C continuous feed (500-lb. capacity) Jet-Blasters are designed to handle all abrasive materials for cleaning, polishing, or etching of any type of surface. Jet-Blasters are available with accessories for wet or dry blasting and new exclusive "Sand-Saver" remote cut-off valve.

Let Us Help You Solve Your Concrete Problems. Our experience in solving unique problems involving the handling of concrete has saved thousands of dollars for others. This experience is available to you. Write, wire or phone us, anytime.



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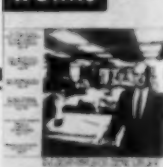


**AIR PLACEMENT  
EQUIPMENT CO.**

1013 WEST 25TH ST. • KANSAS CITY 8, MO.

WORLD'S LEADING MANUFACTURER OF "ADVANCED DESIGN" PNEUMATIC PLACING EQUIPMENT

## PUBLIC WORKS



Richard Hazen is a member of the consulting firm of Hazen & Sawyer, New York, which specializes in all aspects of water—water supply and purification, sewerage, sewage and industrial waste treatment, drainage, flood control, water conservation and hydraulics.

He was graduated from Dartmouth with an AB degree in 1932; he received a BS in CE from Columbia in 1934; and an MS in sanitary engineering from Harvard in 1937. He served for three years during the war with the Civil Engineering Corps, USNR. Following the war he became a partner of Malcolm Pirnie Engineers, remaining there until, in 1951, he formed his present partnership with Alfred W. Sawyer and opened an office in New York. In the years since that time, more than 200 projects have been undertaken by the firm. Recent projects have included work in Libya for Esso Standard and in Saigon-Cholon for the Republic of Vietnam; also a study and report on water and sewer utilities for the New York World's Fair.

Mr. Hazen is a member of many technical societies and associations, including: ASCE; AWWA; APWA; WPCF; AICE; NEWWA; and TAPPI; and has been active in many of them. He is a diplomate of the American Academy of Sanitary Engineers.

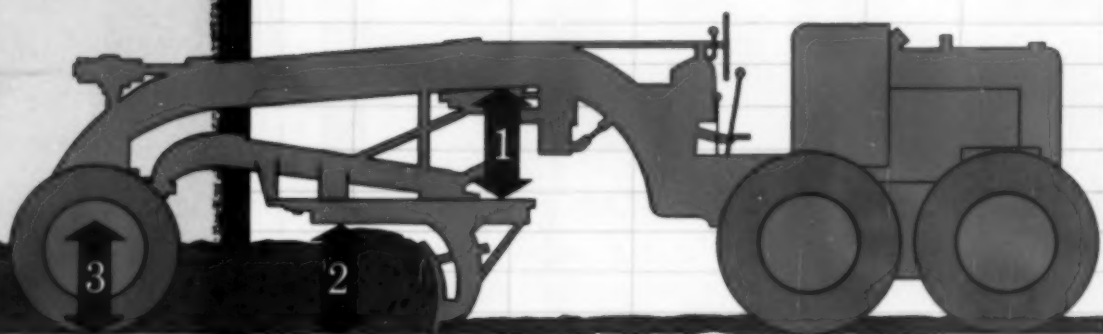
He and Mrs. Hazen have three children—Richard, Jr., now in service in the Army; and two daughters in school. As to hobbies, he says "not enough"; but he has taken part in many local activities in his home town of Dobbs Ferry, N. Y., including service on the Board of Directors of the Children's Village and of the Dobbs Ferry Hospital; and the Board of Education for two years.

# EQUIPMENT COST LEDGER

ITEM	MACHINE	PRICE	OPERATING COST	FUEL	PARTS
<p>See how</p> <p><b>ALLIS-CHALMERS</b></p> <p><b>3-POINT</b></p> <p><b>CLEARANCE</b></p> <p><b>DESIGN</b></p> <p>helps you get</p> <p>full value from your big</p> <p>motor grader investment</p>					

## 3-POINT CLEARANCE DESIGN

helps you get  
full value from your big  
motor grader investment



1. Vertical clearance room (1) is designed into Allis-Chalmers graders from the top down. The high-clearance main frame provides full circle and blade freedom and also allows adequate throat clearance (2) under the circle for full ROLL-AWAY moldboard loads without jamming material.
2. Wide-open design concentrates extra clearance (2) from the circle to the blade cutting edge to allow efficient "cut-lift and high-rolling" action of the ROLL-AWAY moldboard. The larger loads you get from this exclusive moldboard use the higher-than-ordinary clearance to maintain a friction-free rolling action.
3. Because the ROLL-AWAY moldboard, along with the extra "working" clearance, can handle extra capacity, the front axle is arched high (3) to let bigger windrows through to the blade. You'll get more work done—easier and faster.

←  
LIFT THE FLAP

ROLL-AWAY is an Allis-Chalmers trademark.

# GET 3-POINT CLEARANCE D ...FOR FAST, L



available only in these two great  
**ALLIS-CHALMERS** motor graders



## Smart buyers

**Q** If 3-point clearance is so good, why don't others have it?

**A** To get it, other makes would have to redesign their motor graders. Conventional motor graders, designed to *push* loads and not *pull* them, can't use a high-clearance system. However, Allis-Chalmers motor graders are designed with frames to accommodate the extra load and to take advantage of a power-saving advantage of a high-clearance system: a plus circle-to-frame clearance to increase maneuverability.

Any motor grader with a lower clearance will sacrifice the special clearance that makes the 45 and 145 give you.

# DESIGN NOW LOW-COST ROAD WORK



## ers are asking these challenging questions

so good,  
e it?

es would have to completely  
Consequently, they use mold-  
ds at moldboard height. They  
ystem. Allis-Chalmers graders,  
frames at the necessary height  
a load-handling capacity and  
f a ROLL-AWAY moldboard—  
ce to permit complete maneu-

lower main frame has to sacri-  
at makes possible the big pro-  
you.

### **Q** Why don't others change their moldboard design?

**A** Just changing the moldboard won't work because they do not have moldboard-to-circle clearance to accommodate the bigger, rolling loads. To get this clearance would require a complete new machine design—from moldboard through frame.

### **Q** What about visibility?

**A** Allis-Chalmers solved this with a single-member main frame that eliminates split-tail frame gaps. You'll notice, too, the lift cases are mounted close to the frame right over the circle. Control rods are shorter, more compact—don't interfere with operator vision.

But high clearance and big production are only part of the story →

# Allis-Chalmers Motor Graders

## BUILT TO BENEFIT YOU...

**Your Operators...**

**Your Mechanics**



### OPERATOR ACCEPTANCE...

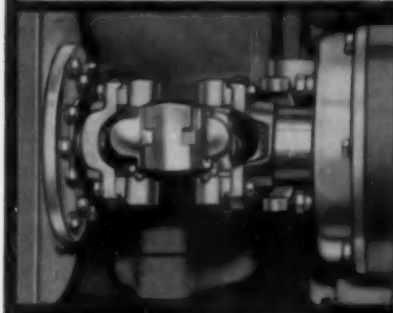
Allis-Chalmers hasn't overlooked the operator. The big deck is cleared for action—with suspended brake and clutch pedals. Toggle-type control levers snap into place—no kickback. Foot pedal changes speed. Comfortable seat and steering wheel are adjustable.



### TOP PRODUCTION...

Exclusive design of the ROLL-AWAY moldboard utilizes engine horsepower more efficiently to move bigger loads. Material is lifted and rolled forward... each load is live and moving... friction drag is reduced. You'll move more material than with any other motor grader of comparable power.

Ordinary Moldboard



### SERVICING EASE...

Practical design put all daily maintenance points in the open. True unit construction speeds shop repairs... double-yoke universal joint provides handy "disconnect" and easy removal and replacement of major parts without disturbing adjacent assemblies.

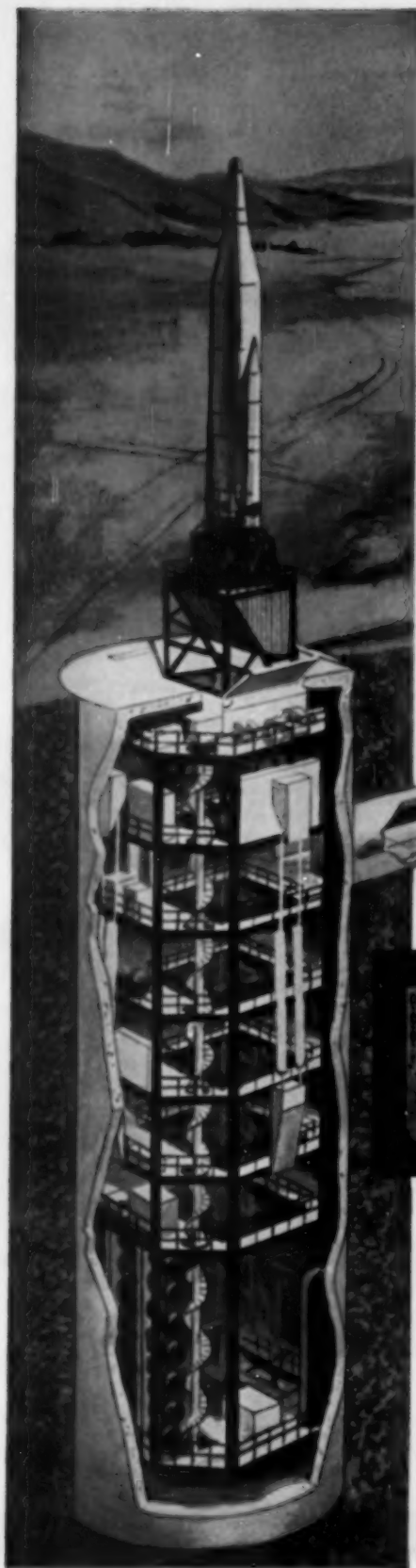
**Find out for yourself.** Your Allis-Chalmers dealer invites you to see these motor graders in action—on your job! Check the high-clearance system and handle the controls yourself—you'll soon know why you can't buy a finer all-round machine. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



move ahead with

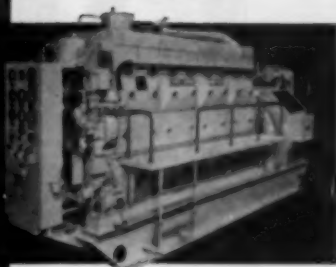
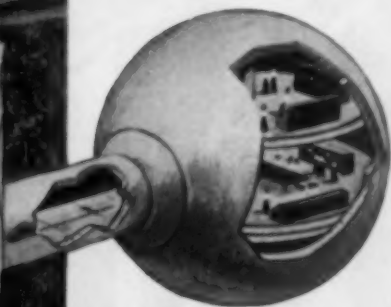
**ALLIS-CHALMERS**

...power for a growing world



## WHITE SUPERIOR ENGINES selected for ATLAS launching sites!

At USAF Atlas launching sites throughout the United States, prime and standby power will be supplied by White Superior engines! The Army Corps of Engineers, Kansas City, Missouri, has purchased 149 eight-cylinder supercharged Model 40 Superiors, each driving a 500 KW generator. These engine-generator sets will produce precise frequency for operation of computers and other electronic equipment. Six of the 13 planned Atlas ICBM squadrons will feature underground silo-type launching sites. Here an additional task for the Superiors will be powering elevator machinery to lift the 120-ton ICBM's to ground level, after they have been fueled and checked out down under.



### White Diesel



WHITE DIESEL ENGINE DIVISION  
THE WHITE MOTOR COMPANY  
Plant and General Offices: Springfield, Ohio

The contract for 149 Superiors highlights a growing and impressive list of Superior-powered U.S. defense installations. Included are the "Texas Towers," portions of "DEW" line and "SAGE" project, Eglin Gulf Test Range and other missile tracking ranges, and numerous launching sites for other types of missiles. Acceptance of Superior engines for these assignments is convincing evidence of their rugged dependability, trouble-free performance and economical fuel consumption. Superior engines—215 to 2150 HP or 150 to 1500 KW—will also meet your exact power requirements, including automatic, unattended or remote controlled operation. Write for complete information today!

*USAF artist's conception of Atlas underground silo for launching missiles*

*"It's an experiment... Ev'rybody  
claims layin' Tyton is as easy  
as fallin' off a log."*



**U.S.**  
cast iron  
**PIPE**

FOR WATER, SEWERAGE AND

# almost as easy!

In their enthusiasm our hillbilly pals sometimes exaggerate.

Tyton Joint® pipe isn't quite as easy to install as falling off a log. But almost! One simple accessory and you're in business! No bell holes. No nuts, bolts, pots or ladles. Fewer weather delays, too. Tyton® can be installed in rain or wet trench, if need be. And even inexperienced crews can lay it.

Want more working days, less time, trouble in the trench? Tyton Joint pipe is your answer. Get the facts. Call or write today.



**U.S. PIPE AND FOUNDRY COMPANY**  
General Office: Birmingham 2, Alabama

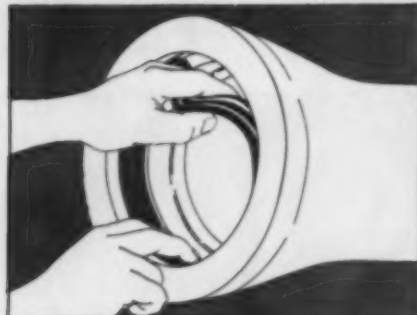
A Wholly Integrated Producer from Mines  
and Blast Furnaces to Finished Pipe.

INDUSTRIAL SERVICE

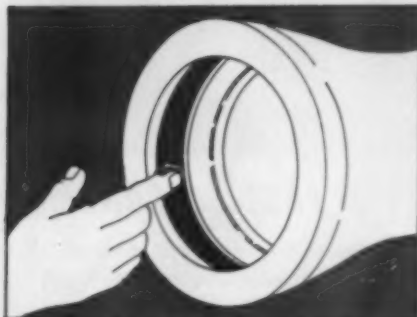
CART IRON

## TYTON®

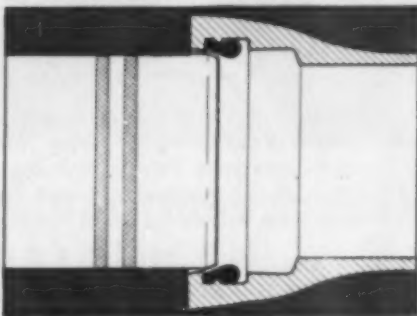
ONLY FOUR SIMPLE ACTIONS



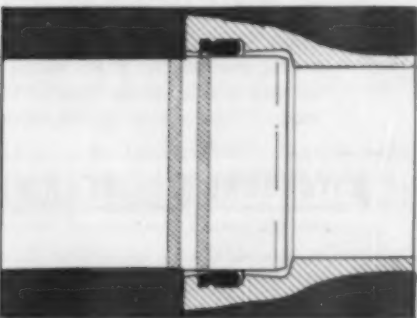
Insert gasket with groove over bead in gasket seat... a simple hand operation.



Wipe film of Tyton Joint® lubricant over inside of gasket. Your receiving pipe is ready.



Insert plain end of entering pipe until it touches gasket. Note two painted stripes on end.



Push entering pipe until the first painted stripe disappears and the second stripe is approximately flush with bell face. The joint is sealed... bottle-tight, permanently! The job's done... fast, efficiently, economically. Could anything be simpler?

# PLAN *Low-Cost* BRUSH DISPOSAL-

## PLAN ON A **FITCHBURG CHIPPER**



### **FAST...ECONOMICAL...SAFE**

Plan on *low-cost* disposal of trimmed branches, whether it's for a tree company, utility, highway department, a city, or a park department—plan on getting a Fitchburg Chipper.

This well-engineered and rugged machine turns brush into easy-to-dispose-of chips, at very low cost. Only the Fitchburg Chipper has an exclusive, patented Feed Plate which automatically adjusts for any size brush up to its rated capacity, making it possible to chip large or small material with ease.

This Spring-Activated Feed Plate reduces shock action and horsepower requirements since it permits chipping of larger size wood without extra power. The Feed Plate results in fast, efficient chipping without a heavy, cumbersome fly wheel. The smoother chipping action means lower maintenance, too, as well as greater crew safety.

This safety feature is important. "Because of the feed plate with its safety spring the men can't get hurt by any back-throw from the Chipper," explains the Superintendent, The Park and Shade Tree Commissions, Bridgeton, New Jersey.

Please send in the coupon for more information, and for copies of articles on chipping which appeared recently in leading publications. These feature articles describe five methods of brush disposal, and ten new ways to utilize "by-product" chips. Send for your copies, they are well worthwhile.

### **FITCHBURG ENGINEERING CORPORATION**

Dept. PW-120, Fitchburg, Massachusetts

- ☐ Please send me important articles which describe 5 methods of brush disposal, and 10 new ways to utilize brush chips.
- ☐ Please send more information on Fitchburg Chippers.

Name

Address

City  Zone  State



#### **MANUAL ON SOILS FOR WATER CONTROL**

The Bureau of Reclamation has published a new edition of its "Earth Manual." This is a successor to the June, 1951, edition. Written by Bureau specialists in the field of soil mechanics, the original text received worldwide use by water resource organizations, public agencies and private engineers.

The new edition provides current technical information relating to field and laboratory investigations of soils used as foundations and materials for dams, canals and many other types of structures built on Reclamation projects in the United States.

Chapter I describes the Unified Soil Classification System developed jointly by the Bureau of Reclamation and the Army Corps of Engineers; Chapter II covers investigations of soils; and Chapter III presents information on the control of construction from the soils standpoint, for both foundation treatment and compaction control of fills.

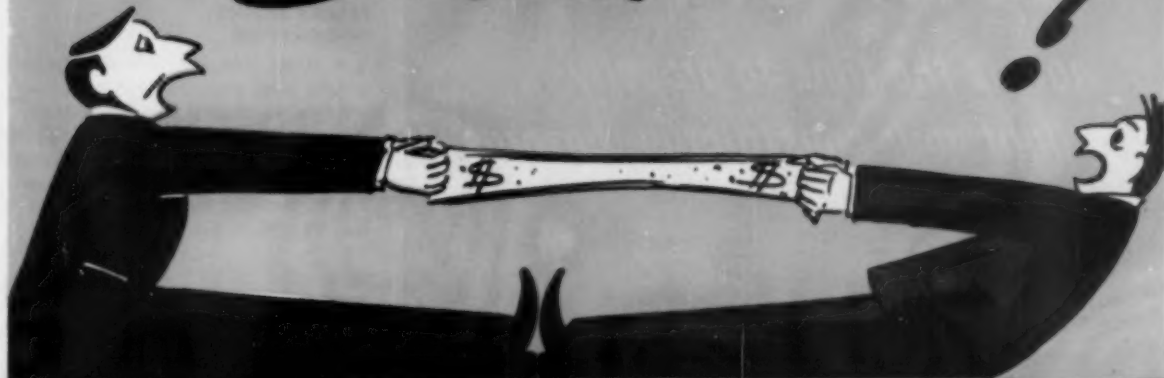
Separate sections are devoted to problems of rolled earth dams, canals and miscellaneous construction features. For each of these, information on design features and usual specifications provisions are given to provide control personnel with a background to assist in implementing the recommended control techniques.

The appendix contains detailed procedures for sampling, classification, and field and laboratory testing of soils.

The manual was prepared under the direction of Grant Bloodgood, Assistant Commissioner and Chief Engineer. Special credit is given in the preface to F. C. Walker, J. W. Hilf, and W. W. Daehn of the Earth Dams Section; W. G. Holtz and A. A. Wagner of the Earth Laboratory Branch; and E. H. Larson, Head of the Manuals and Technical Records Section, all of the Denver, Colorado, engineering staff, as well as to others who contributed in various ways to the publication.

Copies from the Superintendent of Documents, Government Printing

# TRYING TO *Stretch* YOUR SIGN BUDGET?



## Reflectorize with **Lead-Free No. 831 (High Index)** and **UB 68 (Medium Index) Sign Kits**



Write today for free booklet. Contains test and specification data, application procedures, and other helpful information.



If you're in a sign budget dilemma, you'll solve your problem more readily with optical quality No. 831 and UB 68 Reflective Glass Beads. No. 831, best for white and yellow signs, and UB 68, for application in the darker pigmented colors, are lead-free ... won't turn dark, provide extra reflectivity throughout a longer life for greater safety and economy.

Bead budgets go farther ... the result of better research and engineering and advanced methods of manufacture. And with today's overall improvements in quality, gradation, and application techniques, you have the combination that spells better reflectorized signs for less—with whitest white, lead-free, optical quality glass beads by Flex-O-Lite. Write for details.

### **FLEX-O-LITE MFG. CORPORATION**

8301 FLEX-O-LITE DRIVE • P. O. BOX 3066 (AFFTON BRANCH)  
ST. LOUIS 23, MISSOURI

# Winter...

*now is the time to properly  
light your construction hazards*



USE THE  
**DIETZ**  
**3**  
WAY

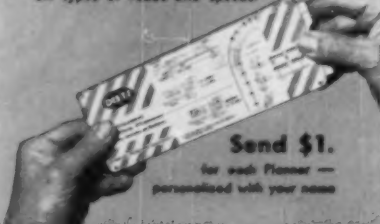
## HAZARD WARNING SYSTEM

**It's Winter...long  
hours of darkness...  
hazardous road  
conditions!**

Protect the public and you protect yourself. Proper lighting of your hazards may save you thousands in tragedies, bad publicity and lawsuits.

### **NEW! DIETZ HAZARD WARNING PLANNER**

**A Practical On-the-Job Tool!** Quickly and easily shows how, when, and where to use each type of warning light for maximum safety under all weather conditions and all types of roads and speeds.



**Send \$1.**

for each Planner —  
personalized with your name

**R. E. DIETZ COMPANY**  
Dept. 1012 Syracuse 1, N.Y.



LANTERNS TORCHES VISI-FLASH

Use Dietz Visi-Flash Lights to alert the on-coming driver. Brightest, safest, most trouble-free flashers on the market. Warn: "Danger Ahead" for up to 1500 hours without changing batteries.

Use Dietz Lanterns to locate hazard in relation to driver's position. Show exact location, shape, extent, and boundaries of hazard area. Burn up to 100 hours.

Use Dietz Torches to guide driver around the hazard. Fully illuminate the danger in every weather. Burn up to 48 hours on low cost kerosene.

**Go DIETZ**  
*and you go Safely*

Office, Washington 25, D.C., or the Bureau of Reclamation, Denver Federal Center, Denver, Colorado, Attention 841. The price is \$3.75, postpaid.

### **SALARY RATING INFORMATION**

A useful pamphlet is available for proper and accurate evaluation of salaries to determine an equitable monthly salary rate. An 8-page booklet provides instructions and graphs. \$2 and a stamped, addressed 9 x 4 envelope. Salary Rating Service, Box 9218, San Diego 9, Calif.

### **SOIL STABILIZATION**

There are 6 papers in this publication which is No. 241 of the Highway Research Board. These papers cover the use of lignin; water in cutback stabilization with asphalt; soil cement and soil-lime-flyash; alkali metal compounds; phosphoric acids and secondary additives; and use of calcium chloride. Available from the HRB, 2101 Constitution Ave., Washington. 126 pages; \$2.40

### **SELECTING AREAS FOR CONSERVATION**

This 16-page manual covers such urban renewal topics as why a start should be made now; how to begin; what to look for; and how to be successful. 15 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

### **NATIONAL WATER QUALITY NETWORK**

This presents the second annual compilation of data from the National Water Quality Network, covering the period from Oct. 1, 1958 to Sept. 30, 1959. Some trends in pollution levels are reported as being discernible. Also, this past year the network has added Strontium-90 and heavy metals analyses to the examinations made during the first year. The sampling stations are shown on a well-prepared map and a table of them, of cooperating agencies and of stream flow records is provided. Analytical data include: Radioactivity determinations (gross alpha and beta and strontium-90); plankton populations; organic chemicals; chemical, physical and bacteriological; and trace elements, 323 pages, Public Health Service Publication No. 663. For sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C. \$1.75.

**Quality costs less  
in the long run!**

### **BJ Vertical Circulating Pumps**

Designed to deliver water in large volume, BJ Vertical Circulating Pumps are in use on some of the Nation's largest industrial and governmental projects.

These BJ Quality Pumps are ideal for cooling tower circulation, irrigation service, flood control projects, municipal primary water pumping, river intake, dewatering for large construction, condenser circulation, industrial processing and other big jobs which demand the economy of long, reliable service.

Operating continuously with high efficiency, BJ Circulating Pumps are self-priming and require only a simple installation. Available in capacities to 50,000 GPM in standard models, and beyond on special order!

### **San Luis Water District**

Located in California's San Joaquin Valley, the state's largest private agricultural improvement project has installed 10 BJ Vertical Circulating Pumps. Five at Station #1 total 4100 HP and deliver 69,600 GPM, while five more pumps at Station #2 handle 53,900 GPM using 2150 HP.

### **BYRON JACKSON PUMPS, INC.**

Subsidiary of Borg-Warner Corporation  
P.O. Box 2017-A, Terminal Annex,  
Los Angeles 54, California

**BW**



**ECONOMY NEVER  
CAME IN SUCH  
A CHOICE**

# NEW '61 FORD TRUCKS



## 619 new models!

All engineered with one idea in mind... economy! New one-piece cab-body design for Styleside Pickups! New "Big Six" power for 2-tonners! New Econoline models that pack bigger loads in three feet less truck length! All at prices that give you a flying start to long-term savings. On all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs, wiper blades and ignition points.

## New Falcon Pickup

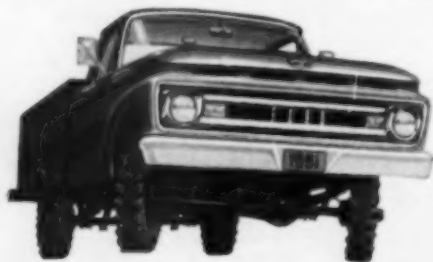
**Economy never had such style!**

Meet the pickup that's priced\* as much as \$231 less than leading conventional pickups! It delivered over thirty miles per gallon in certified tests! Big six-foot box with low (25.2 in.) loading height! And now—a new 170 high-performance Six plus the 144 Economy Six engine!



## New 4-Wheel Drive Pickups

Ford's low-priced 4 x 4 models have the getup and traction to go most anywhere... road or no road! You can choose from two modern engines—the gas-saving 135-hp Six or the 160-hp V-8 that gives extra power and smoothness with "six-like" economy.



## New "Big Six" Engine

More power for America's savingest 2-tonners

Now . . . in a new, big 262-cu. in. Six, Ford gives you the power of big displacement, the durability of heavy-duty construction, plus the gas economy of 6-cylinder design! Available early 1961. New 2-ton toughness, too, with a stronger, heavier frame . . . new riding comfort with new, smoother acting springs . . . and a rugged true-truck front suspension that can give up to twice the tire life of "soft" car-type suspensions!



## New Styleside Pickup

Leader in looks, loadspace and low costs!

Ford's 6½- and 8-foot bodies both offer greater loadspace for '61—as much as 16% more! New one-piece cab-body design on a longer wheelbase gives greater strength, new comfort! And look at these savings:

Save up to \$157 on price\*! Ford Styleside Pickups are priced below all other comparable pickups! Save up to \$219 on gas! Ford Sixes beat all leading competitive sixes in certified tests—scored up to 27% more mpg. That figures out to \$219 in 50,000 miles! Save up to \$150 on tires! In certified tests of truck suspension systems, Ford front tires lasted up to twice as long. In 50,000 miles, that can add up to \$150!

## FORD TRUCKS COST LESS

YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE!

FORD DIVISION, Ford Motor Company.



## New Econoline

America's lowest-priced\* pickup—bar none!

Meet a revolutionary new pickup that saves more ways than any truck you've known! Modern cab-forward design pares away over a thousand pounds of dead weight, yet you get as much payload capacity as standard ½-tonners! It's three feet shorter over-all, yet there's a big 7-ft. box with 73 cubic feet of loadspace! You get lively performance in a proven Falcon Six that delivered up to 40% better gas mileage in certified tests!

\*Based on a comparison of latest available manufacturers' suggested retail delivered prices



# Equipment and Materials for your PUBLIC WORKS PROGRAM

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

## NEW LISTINGS

### Self-Contained, Portable Drive Unit

48. . . for use as a hand-held pavement breaker, clay spade, tamper or rock drill weighs only 5.5 lbs. The gasoline powered Cobra contains a built-in air compressor for air-blown flushing of the drilled hole. Get illustrated bulletin E 1155 from Atlas Copco, 545 Fifth Avenue, New York 17, N. Y., or use the reply card.

### Playground Equipment for Schools and Parks

73. Catalog L describes the complete line of swings, slides, or saws, merry-go-rounds, climbing units, picnic tables, prefabricated stages, bleacher sections, bicycle racks and equipment for competitive games available from J. E. Burke Co., New Brunswick, N. J. Write for 56-page catalog or check the reply card.

### Standby or Continuous Off-the-Line Power

91. . . and how to provide it by GM diesel generating sets is detailed in 8-page bulletin. Technical data are given on fourteen models, 13.5 to 260 KW. Automatic starting, shut-off and frequency and voltage regulation equipment and its applications are among features described. Get copies of the bulletin (Form SSA68) by writing the Advertising Dept., Detroit Diesel Engine Division, Detroit 28, Mich., or circle the reply card.

### For Preventing Overloads On Sludge Collector Drives

99. "Modern Clutching for Water and Sewage Treatment Plants" is the title of a treatise on the Tri-O-Matic overload release clutches. Specific types of drives are described by means of typical layouts, dimension tables and illustrations. Write to Centric Clutch Co., U. S. Route 9 at Main St., Woodbridge, N. J. or circle the reply card.

### Rubber Joints for All Types of Concrete Pipe

205. . . are described and their advantages outlined in a new Engineering Manual which engineers in particular, will find valuable with respect to physical properties and performance characteristics of rubber compounds used in such joints. Plenty of on-the-job illustrations of value to contractors and all pipe-layers. Address Hamilton Kent Mfg. Co., 427 W. Grant St., Kent, Ohio, or check our card-number.

### How to Save \$264 per Mile

216. . . in sewer cleaning is the gist of a new 8-page brochure that discusses just how such savings can be accomplished. It costs nothing to find out and it may be your best investment of the day. Write for it to Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif., or circle the card-number herewith.

### Sewage Pumps That Minimize Clogging

220. This is the theme of a new 4-page folder that discusses both clogging and Gorman-Rupp sewage pumps; it is guaranteed to throw clear light on this old problem and to tell what pumps can reduce its frequency. For your free copy write The Gorman-Rupp Co., Mansfield, Ohio, or circle the number on our card.

### New Bulletin on Water and Waste Treatment Equipment

229. . . Just issued, describes and illustrates major equipment, such as clarifiers, digesters, distributors, covers, sludge heaters and flocculation and mixing mechanisms. Also a page on ejectors and pumps. For your copy write Ralph B. Carter Co., Hackensack, N. J., or just circle the number on our card.

### Lo-Loss Flow Tube

232. Folder illustrates how this tube accomplishes extremely accurate measurement of all fluid flows with lowest head loss. Lists ten distinctive advantages that you will want to know more about. Address Burgess-Manning Co., Penn Instruments Div., 4110 Haverford Ave., Philadelphia 4, Pa., or circle our card-number for it.

### Marlow Vari-Mix Plunger Pump

241. Descriptive and specification sheets outline this novel means of variable flow withdrawal of concentrated sludge at a uniform rate with maximum self-cleaning velocity and minimum of maintenance problems. For your copy, write Marlow Pumps Div., Bell & Gossett Co., Midland Park, N. J., or ring the card-number herewith.

### A Diaphragm Valve for Hard-to-Handle Fluids

253. Offers a "straight through" path with no dam to trap scale and suspended matter. Sizes 1/2-inch to 14-inch, pressures up to 250 psi. New folder describes the Arcs-Wynn diaphragm valves and how and why they work. Get Bulletin 159 from Automotive Rubber Co., Inc., 12550 Beech Road, Detroit 39, Mich.

### Packaged Pump Stations for Sewage

306. . . of advanced design and with six advantages not "packaged" for you elsewhere, are covered in this informative Bulletin No. PS-60R to be had by writing Tex-Vit Supply Co. Mfg. Div., Box 117, Mineral Wells, Texas.

### Select Your Incinerator Scientifically

273. Here is a new swift simple way of selecting the correct industrial, institutional or business-use incinerators for various types of installations. The device is somewhat like a slide rule and takes in the variable factors which determine choices in incinerators. Get yours from Morse Boulder Inc., 80 Fifth Ave., New York 11, N. Y., or check number on our card.

### Wider Roads Need Wider Lighting



312. . . how your problem is met with luminaires that combine attractiveness, durability and easy maintenance with new illuminating efficiency is described in a new folder 60-158 now ready for you. Address Westinghouse Electric Corp., Lighting Division, P. O. Drawer 5817, Cleveland, Ohio, or check reply card.

### Cut Down Your Underground Explorations

276. . . for buried pipe by knowing where it is before you start digging for it. "Typical Pipe Detection Problems and Their Solution" is the title of a free 24-page illustrated, pocket-size book that tells you how to find and determine the depth of buried pipes, conduits, wires and cables. Address Computer-Measurements Co., 12970 Bradley Ave., Sylmar, Calif. or check above number on our card.

### 40 Pages of Welding Facts

278. . . are offered you in this new Lincoln "Weldirectory" of arc welding electrodes, equipment and supplies. Discusses procedures in welding; a very handy volume for all with welding jobs. Address The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio.

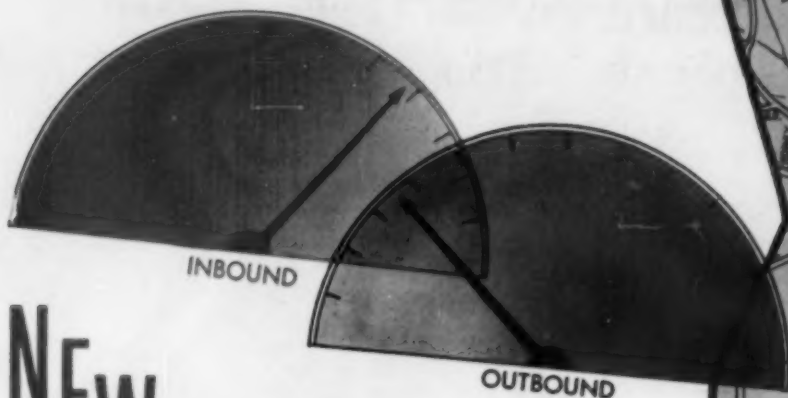
### Save Time Lost in Lettering

286. Engineers know how time mounts up. This striking folder tells you how you can save labor and money by saving time in lettering tracings. Ask for Folder 126 from Varityper Corp., 720 Frelinghuysen Ave., Newark 12, N. J., or check our card.

**USE THIS CARD to get detailed information**  
on products and services mentioned in this issue.  
Circle numbers below and mail today.

Circle numbers from 48 to 55	56 to 65	66 to 75	76 to 85	86 to 95	96 to 105	106 to 115	116 to 125	126 to 135	136 to 145	146 to 155	156 to 165	166 to 175	176 to 185	186 to 195	196 to 205	206 to 215	216 to 225	226 to 235	236 to 245	246 to 255	256 to 265	266 to 275	276 to 285	286 to 295	296 to 305	306 to 315	316 to 325	326 to 335	336 to 345	346 to 355	356 to 365	366 to 375	376 to 385	386 to 395	396 to 405	406 to 415	416 to 425	426 to 435	436 to 445	446 to 455	456 to 465	466 to 475	476 to 485	486 to 495	496 to 505	506 to 515	516 to 525	526 to 535	536 to 545	546 to 555	556 to 565	566 to 575	576 to 585	586 to 595	596 to 605	606 to 615	616 to 625	626 to 635	636 to 645	646 to 655	656 to 665	666 to 675	676 to 685	686 to 695	696 to 705	706 to 715	716 to 725	726 to 735	736 to 745	746 to 755	756 to 765	766 to 775	776 to 785	786 to 795	796 to 805	806 to 815	816 to 825	826 to 835	836 to 845	846 to 855	856 to 865	866 to 875	876 to 885	886 to 895	896 to 905	906 to 915	916 to 925	926 to 935	936 to 945	946 to 955	956 to 965	966 to 975	976 to 985	986 to 995	996 to 1005
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# NEW TM SYSTEM

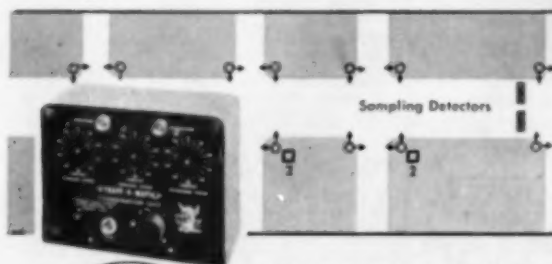
**provides traffic-actuated signal control for arterial flow . . . automatically . . . for less money**

The TRAFF-O-MATIC® TM SYSTEM is a traffic-actuated, 3-offset, 3-cycle length system that provides a low cost method of arterial signal control. It responds to actual traffic changes without time clocks . . . without program drums.

Continuously and automatically the TM System seeks and selects the most favorable offset and cycle length combination based on the relative volume levels of two sampled directions of traffic flow. Operating adjustments are made without tools. Circuitry and component construction incorporate the latest design techniques for maximum service and ease of maintenance.

1 ■ TRAFF-O-MATIC MASTER MODEL TM-1 maintains continuous inbound-outbound volume comparison . . . automatically selects one of three offsets to best serve traffic flow, in addition to free operation at low volumes.

2 □ TRAFF-O-MATIC COORDINATING UNIT MODEL TM-21, one with each local semi-actuated controller, interprets Master's offset instructions . . . easy knob adjustment of three offsets . . . each offset can be assigned an individual background cycle length.



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## AUTOMATIC SIGNAL DIVISION

EASTERN INDUSTRIES, INCORPORATED  
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To order these helpful booklets check the reply card opposite page 38.

## NEW LISTINGS (Cont.)

### Get More Water Out of That Same Well

226. Six-page brochure tells how to accomplish this with the Hydro-Sonic Process which uses the controlled force of underwater shock waves to unplug apertures in your well screens. A proven process is described and illustrated. Address Halliburton Co., Duncan, Okla., for your copy, or circle this card number.

### Something Has Been Added to Aeration Technique

268. New 8-page booklet discusses improvement through use of Plate Tube Porous Diffusers now available in addition to the Sparger type. This may be the answer to your clogging troubles with air diffusers in activated sludge plants. For your booklet 22-S-96 address Walker Process Equipment, Inc., Aurora, Ill., or circle our card number.

### New Data on Straightline Sludge Collectors

292. . . . is in a 28-page new booklet, with engineering data on these Collectors that will enable you readily and economically to design water, and sewage or industrial wastes treatment projects. Published by Link-Belt Co., Colmar, Pa. For your copy contact your nearest Link-Belt office, or just circle our card number.

### Read Your Sludge Consistency

296. Eliminate any problem associated with maintaining proper sludge consistencies for better operating efficiency. Circular describes how this new Automatic Pump Control "reads" sludge condition and controls your pump operation more unerringly than any human. Address Komline-Sanderson Engineering Corp., Peapack, N. J., or ring the number on card.

### The First New Light Source in a Generation

312. . . . is the arresting statement in a new circular on Fluoromic 1750-watt light bulbs, claimed to deliver nearly 60,000 lumens at half the wattage consumed by incandescents. Used indoors or out. Facts are in Form 640 bulletin, to be had from Duro-Test Corp., North Bergen, N. J., or by circling card-number.

### Factory-Built Sewage Treatment Plants

313. If you plan one, plan first to get this latest booklet on them. Tables, data charts and specifications are compactly given in its 14 pages. Ask for Catalog 504, from Public Works Div., Schmieg Industries Inc., P. O. Box 4701, Detroit 34, Mich. Or circle this card number.

### For Rest Area Odor Control

324. Whether your problem is located out on the highways or in urban areas this circular describes how to end smells by destroying the bacteria which create them. Simple, swift, sure. Get information from Werley Chemical Supply Co., 1505 Broadway, Cleveland 15, Ohio, or circle number on reply card.

### To Make Your Street Sweepers More Efficient

332. Get this "Operating Recommendations" sheet showing correct broom settings and discussing common mechanical sweeper problems and how best to overcome them. For your copy, address Rynal Corp., 114 St. Joseph St., Arcadia, Calif., or circle the number on our card.

### If You Can't Stop Snow or Ice At Least Get Rid of Them Faster

333. A 4-page illustrated folder on chemical mixtures in Winter Maintenance Work shows maintenance personnel how to get best results with proper mixtures. Pictures show exact procedures in simplest form. Free on request from Calcium Chloride Institute, 909 Ring Bldg., Washington 6, D. C.

### To Support Your Arguments for Better Highways

348. Why not get this 4-page booklet on "Why Do We Need Good Highways?" Full of reasons why adequate highways are an investment and not a cost, for if we need them we pay for them—whether we get them or not. Address Iowa Mfg. Co., Cedar Rapids, Iowa.

### Astronomical, Surveying Instrument Manual

349. Latest edition of a 192-page, combination astronomical and surveying instrument manual is packed with diagrams, charts, schematic drawings and illustrations, the "1960 Solar Ephemeris and Surveying Instrument Manual" (C) is pocket-sized for easy carrying and quick reference. For copies write Keuffel & Esser Co., 300 Adams St., Hoboken, N. J.

### Plan Now for Your Spring Mowing

351. It won't be long before spring mowing problems will arise on highways, turnpikes and airports, as well as in parks, and on public golf courses, and institutional grounds of cities, counties and states. For a booklet with complete information on equipment available, and some helpful advice and data, write Jacobsen Mfg. Co., Racine, Wisc., direct, or by circling our card number here.

### Upgrade Sewage Sludge Fertilizer

353. . . . by converting undesirable fines to saleable material. "Compactor" exerts pressure on the fine material by passing it through smooth rolls, producing a ribbon of compacted fines, which breaks up into flakes. Write for details on "Compactor" mill from Allis-Chalmers Mfg. Co., Industrial Equipment Div., Milwaukee 1, Wisc., or circle the reply card.

### Never Mind The Tank's Shape

355. There's a Walker Process collector for the sludge. This new book adds detailed data on their circular collectors that designing engineers in the industrial waste, sewage and water treatment fields will find useful. Write for Bulletin No. 9-W-63 to Walker Process Equipment, Inc., 840 N. Russell, Aurora, Ill.

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Standard Traffic Signs Available for Immediate Delivery at Northeastern Warehouse  
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to your LOAD-AREA requirements



Now you can get a GYRO-FLO portable compressor with the right combination of space, weight and power for any operating conditions

## 1. For METROPOLITAN AREAS

it's the Power-Takeoff unit

This super-compact Gyro-Flo compressor, for direct or belt drive from the service truck power-takeoff, is ideal for busy metropolitan areas where truck size must be kept to the minimum. These 85-cfm and 125-cfm compressors take less than 3.6 and 4.9 sq ft of floor space respectively, leaving plenty of extra space for men and equipment. Air-operated engine speed control and combination air receiver and oil separator can be mounted wherever convenient.

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Where larger service trucks can be used and space is less critical, self-powered 85-cfm and 125-cfm Gyro-Flo compressors for truck mounting offer the advantages of maximum fuel economy, simplicity of operation and reduced wear and tear on the truck motor. There are no gears,

clutches or belts and the compressor can be removed to free the truck, if necessary, when only the compressor is needed on the job.

## 3. For OUTLYING AREAS

it's the Completely Self-Contained Portable unit

Where there's ample room for needed equipment at the job site, the completely self-contained Gyro-Flo portable compressor offers maximum convenience, flexibility and economy. You can tow it to the job and immediately release the truck for other work. Wheeled units are available in sizes from 85-cfm to 900-cfm, to meet any air power requirements.

Ask your Ingersoll-Rand Distributor or engineer for complete information on the Gyro-Flo that will meet your needs to best advantage.

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**The World's Most Comprehensive Compressor Experience**

To order these helpful booklets check the reply card opposite page 38.

## NEW LISTINGS (Cont.)

### Prefabricated Sewage Ejector

356. Komline-Sanderson has a new two-color, four-page brochure on pneumatic sewage ejector stations. Construction features; compressor motor horsepower selection chart; plan and elevation drawings of station. Write Komline-Sanderson Engineering Corporation, Peapack, N. J., asking for Bulletin KSM-3, or use the card.

### Heavy-Duty Crane Carrier

358. . . is described and illustrated, with specifications, in a two-color bulletin. Carrier is designed for long-reach jobs for maximum stability and rigidity. For this Bulletin #A-303 write Schield Bantam Co., Waverly, Iowa.

### Gate Valves

369. A new publication has been issued especially for designers of sewage and waste treatment plants. Write for Circular No. 24 to M & H Valve and Fittings Co., Anniston, Ala., or check the card-number.

### Scrub-and-Polish the Air

373. In vacuum pumps and in air operated equipment of all kinds. 100% removal of entrained dirt, oil and water from the air is desirable. Why and how are given in a handsome new catalog, No. 6000. King Engineering Corp., P. O. Box 735, Ann Arbor, Mich., or use our card.

### Microstraining: A Success Story

375. New 4-page description of the Marston Lake, Denver, Colo., installation, from inception through tests to results and benefits. Engineers responsible for water, sewage and industrial wastes treatment will find it both interesting and valuable. Glenfield & Kennedy Inc., 275 Halstead Ave., Harrison, N. Y., or use the card.

### Bituminous Distributors for Public Works Uses

376. New "Road Builders" bulletin includes description of distributors 1000 to 1500-gallon capacities, including the Model 658 with "compact car" design, plus tar kettles, spreaders, and construction brooms. A lot of good information. Bulletin SE-60-25M, Standard Steel Works, Inc., North Kansas City 16, Mo.

### Are You Using the Right Coagulant?

381. This question, and its answer, are included in new folder that packs much valuable guidance in water and sewage treatment. Read a little and learn a lot. Write to Tennessee Corp., Box 2205, Atlanta 1, Ga., or circle our card-number.

### Total Oxidation In a Package

382. A new bulletin on "Oxy-Pak" factory-built total oxidation plants for waste treatment for populations from 10 to 3,000 is available. Approximate design considerations for a guide to engineers. Bulletin 417, American Well Works, Aurora, Ill.

### Added Loader Attachments Add More Mileage for Your Tax Dollar

383. . . are the intriguing title and content of this handy 16-page pocket-size booklet listing new equipment and new uses for the PAYLOADER you have or the one you are going to get. Ask for "More Mileage" from the Frank G. Hough Co., Libertyville, Ill.

### Selection of a Small Packaged Air Compressor

387. Catalog 1548 contains tabular and chart information on cu. ft. of air required to operate a variety of pneumatic equipment, average and continuous air supply tables and charts on ratios of compression and tables on flow of air through orifices. Check the reply card or write Ingersoll-Rand Co., News Service Dept., Phillipsburg, N. J.

### Soil Sampling is a New and Necessary Art

374. Latest developments in it are fully covered in this new booklet that belongs in your files, as news now and for quick reference always. Bulletin No. 300-1, Sprague & Henwood, Inc., Scranton 2, Pa., or circle our card-number.

## BUSINESS ADMINISTRATION

### Save Space By Filming Your Records

377. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 413 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

### If You are Considering a trustee for a Bond Issue Check with Chase Manhattan

326. For details on how a bank serves as trustee for bond issues for any municipal or governmental unit, write The Chase Manhattan Bank, 40 Wall St., New York 15, N. Y.

### Monthly Time and Cost Record Book

349. To assist owners in determining the cost of owning and operating equipment Caterpillar Tractor Co., News Service, Peoria, Ill., has prepared a 24-page monthly time and cost record book. Twelve sets of pages are included on which to record day by day machine expenses for an entire year. Check the reply card for your copy.

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ELGIN STREET KING	\$258.20	\$388.10
ELGIN WHITE WING	\$258.20	\$388.10
ELGIN 20, 30, and 81	\$270.15	\$399.95
AUSTIN-WESTERN 40	\$208.15	\$303.55
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## TG-500 "ROLLGATE"

### All-weather Spreader

**All new... low-cost Rollgate Spreader delivers big results!**

The all new "Rollgate" is a hydraulically driven roll type spreader, designed to fasten to any standard 7 1/2 or 8 foot wide dump truck body. It is one man operated and provides an even flow of materials over the 8 foot width of the spreader. Spreads salt from 75 lbs. per mile to any desired amount or from feather edge to 3" depths when seal-coating.

Hydraulic adjustment provides the most efficient and economical control for spreading sand, salt, cinders, gravel, slag or other materials up to one inch in diameter. The "Rollgate's" speed, versatility, simplicity, and low original cost enables cities, villages and townships to utilize one piece of equipment for spreading operations in all seasons.

For complete details see your local distributor, or write to:




**GOOD ROADS MACHINERY CORPORATION**  
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## *New four-cylinder power speeds loading* with **John Deere TEN-TEN**

Now, with 40 engine horsepower—the greatest work capacity ever offered in a compact John Deere Crawler—the new Ten-Ten Crawler provides all the benefits of smooth-handling 4-cylinder, 4-cycle design. New John Deere gasoline and Diesel engines provide wide-range performance—operating efficiently through the full throttle range. For top operator efficiency, an optional new hydraulic direction reverser with wet clutch eliminates shifting and clutching while loading—speeds cycle time.

A single operating lever controls all movements of loader lift arms and bucket. Self-leveling 3/4-yard bucket has a roll-back of 40 degrees, developing 8500 pounds breakout. Full-height lift capacity is 4000 pounds, and dump clearance tops 8 feet.

Check the classified pages of your phone directory for the name of your John Deere dealer. He'll be glad to demonstrate new Ten-Ten loading power for you and provide any additional information you require.

**JOHN DEERE • 3300 RIVER DRIVE • MOLINE, ILLINOIS**



**EARTHMOVING  
LANDSCAPING  
AND  
MATERIAL  
HANDLING  
EQUIPMENT**

To order these helpful booklets check the reply card opposite page 38.

## WATER WORKS

### Equipment For Water, Sewage and Industrial Waste Treatment

24. The complete line of Jeffrey equipment for treatment plants is covered in a 64-page Catalog 952 available from The Jeffrey Mfg. Co., Columbus 16, Ohio. Check the reply card for information on bar and disc type screens, traveling water screens, grinders, grit collectors, garbage grinders, sludge, draw-off valves, chemical feeders, bucket elevators and scum removers to mention some of the equipment.

### To Avoid Point and Coatings Errors

50. First consult "A Catechism on Categories of Corrosion," a pocket sized brochure that enables you to share the expert knowledge of Hercules Powder Co., Cellulose Products Dept., Wilmington 99, Del. Finding out is free; not knowing could be costly.

### How to Select Right Angle Drives

62. Data-filled Catalog 31 of Johnson Gear & Mfg. Co., Ltd., 8th & Parker Sts., Berkeley 10, Calif., makes it easy to select the correct right-angle gear drive for deep well turbine and other vertical shaft pumps. Includes details on the Johnson "Redi-Torq" gear drive. To get your copy just check the reply card.

### Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co., Independence Sq., Philadelphia 3, Pa., presents specifications for "Sand-Soun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews and R. D. Wood fire hydrant and R. D. Wood gate valves.

### What You Should Know About Venturi Tubes and Nozzles

105. Bulletin No. 100 contains a short description of the various types of Venturi tubes used for water, sewage or sludge service. This is a condensed bulletin which should be in the files of all consulting and designing engineers involved in water and sewage works design. Write Simplex Valve and Meter Co., 7 East Orange St., Lancaster, Pa. or check the reply card.

### Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

### Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp., Box 33-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

### Guide Book Information for Emergency Power

153. This book covers what to do when commercial power fails in a fire, flood, hurricane, war and other national disasters. Check the reply card or write Caterpillar Tractor Co., Engine Div., Peoria, Ill., for a copy of "The Four Horsemen of the Space Age."

### AWWA Fire Hydrants and Gate Valves

155. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

### A Comprehensive Handbook on Water Meter Settings

174. "The Engineering of Water Meter Settings" contains 34 pages of clearly illustrated data and specifications to help improve your practices and simplify your work. Every Water Department should have a copy of this valuable reference book. To get yours address Ford Meter Box Co., Inc., Wabash, Indiana, or use the inquiry card.

### The Design and Function of Elevated Steel Water Tanks

179. A 20-page bulletin of engineering information with illustrations of typical installations, emphasizing ellipsoidal, radial cone and spheroidal designs, may be obtained by writing Chicago Bridge and Iron Co., Advertising Dept., 332 South Michigan Ave., Chicago 4, Ill. or by checking the reply card.

### Engineering Data

#### On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

#### U. S. Tyton Joint Pipe

210. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids is available. Tyton Joint cast iron pipe is provided with a simple, sturdy and tight slip-on type of joint. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co., Birmingham 2, Ala., or check the reply card.

### To Meet Increasing Water Demands, These Two Steps Will Help

247. Two new products designed to help meet constantly increasing demands for water are described in a folder of Hersey-Sparling Meter Co., 250 Elm St., Deham, Mass. These are a flow analyzer that provides strip chart rate of flow and volume records, and a two-rate register that can be substituted for the flow analyzer. Get this data by checking our reply card.



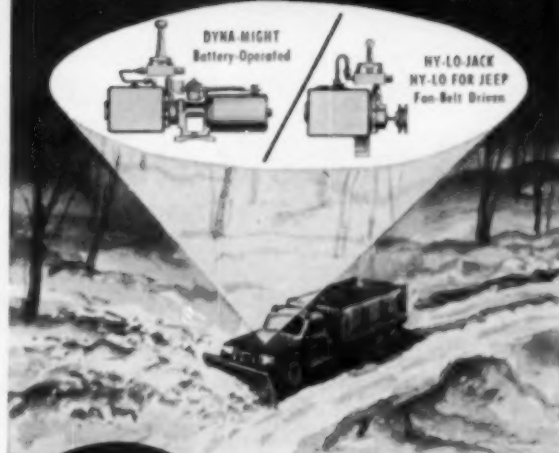
## SPEED SENSITIVE SWITCHES

All GH series of cable driven governors and switches are available in this GH-E series. This housing meets the specifications for class 1 group D, Explosion Proof Equipment. For further information, write for Bulletin 504-A.

### SYNCHRO-START PRODUCTS, INC.

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power hydraulic controls lift and lower snow plows automatically!

Be sure your equipment is equipped with Monarch units—makes snow removal jobs faster, easier, more economical. One man controls the plow right from the cab... instant up-and-down action with the flick of a wrist. A Monarch control can be quickly installed. See your dealer. Send for free folder today.



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December 1960

Please send me literature on the following items described in PUBLIC WORKS:

#### Readers' Service Booklets Appear on Pages 32 to 48

20	62	109	174	212	241	275	296	333	367	381	438	519	571	692
21	63	112	179	216	247	276	305	348	368	382	455	524	572	694
24	75	122	180	220	248	278	306	349	369	383	461	527	586	695
31	76	128	183	226	249	280	309	351	371	384	470	535	603	698
42	91	131	186	229	253	281	311	353	373	387	472	540	616	
50	96	153	195	232	254	286	312	355	374	391	475	543	623	
51	98	155	204	236	268	292	313	356	375	407	491	545	662	
57	99	160	205	237	270	294	324	358	376	409	507	555	689	
60	105	167	210	240	274	295	332	365	379	425	513	559	691	

#### New Equipment Items Appear on Pages 162 to 168

12-1	12-2	12-3	12-4	12-5	12-6	12-7	12-8	12-9	12-10	12-11	12-12	12-13	12-14
12-15	12-16	12-17	12-18	12-19	12-20	12-21	12-22	12-23	12-24	12-25	12-26	12-27	12-28
12-29	12-30	12-31	12-32	12-33									

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City \_\_\_\_\_ State \_\_\_\_\_

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# Meetings and Conventions

## Highway Research Board

Sheraton-Park Hotel, Washington, D. C., Jan. 9-13, 1961. Dir., Fred Burggraf, 2101 Constitution Ave., Washington 25, D. C.

## New York Sewage and Industrial Wastes Assn.

Park Sheraton Hotel, New York City, N. Y., Jan. 18-20, 1961. Exec. Sec., Ralph C. Sweeney, c/o State Dept. of Health, 55 Church St., White Plains, N. Y.

## American Water Works Assn.

New York Section, Park Sheraton Hotel, New York City, N. Y., Jan. 24, 1961. Sec.-Treas., Kimball Blanchard, c/o Neptune Meter Co., 22-22 Jackson Ave., Long Island City 1, N. Y.

## California Street and Highway Conference

University of California, Berkeley Campus, Berkeley, Calif., Jan. 26-28, 1961. Chairman, John A. Morin, City Engineer of Oakland, Calif.

## National Bituminous Concrete Assn.

Shamrock-Hilton Hotel, Houston, Tex., Jan. 28-Feb. 1, 1961. Chairman, Hugh McMillan, El Paso, Tex.

## American Water Works Assn.

Indiana Section, Sheraton-Lincoln Hotel, Indianapolis, Ind., Feb. 1-3, 1961. Sec., Chester H. Canham, State Board of Health, 1330 W. Virginia St., Indianapolis, Ind.

## Associated General Contractors of America, Inc.

Hotel Statler, Boston, Mass., Feb. 26-Mar. 2, 1961. Exec. Dir., James D. Marshall, 20th & E St., N.W., Washington 6, D. C.

## American Road Builders' Assn.

Chalfonte-Haddon Hall, Atlantic City, N. J., Mar. 5-9, 1961. Vice Pres., Louis W. Prentiss, 600 World Center Bldg., Washington 6, D. C.

## Mississippi Sewage and Industrial Wastes Assn.

Robert E. Lee Hotel, Jackson, Miss., Mar. 10, 1961. Sec.-Treas., Neil G. McMahon, Mississippi State Board of Health, Jackson, Miss.

## New Jersey Water Pollution Control Assn.

Traymore Hotel, Atlantic City, N. J., March 15-17, 1961. Sec.-Treas., Anthony T. Leahy, P.O. Box 22, West Trenton, N. J.

## American Water Works Assn.

New England Section, Statler-Hilton Hotel, Boston, Mass., Mar. 16, 1961. Sec., Ralph M. Soule, San. Engr., State Dept. of Public Health, Boston, Mass.

## Association of Highway Officials of the North Atlantic States

Hotel Traymore, Atlantic City, N. J., Mar. 22-24, 1961.

## American Water Works Assn.

Illinois Section, LaSalle Hotel, Chicago, Ill., Mar. 22-24, 1961. Sec., Dewey W. Johnson, Research Engr., Cast Iron Pipe Research Assn., 3440 Prudential Plaza, Chicago 1, Ill.

## 47th Annual Purdue Road School

Purdue University, Lafayette, Ind., Mar. 27-30, 1961. Purdue University, Lafayette, Ind.

## American Water Works Assn.

Cobo Hall, Detroit, Mich., June 4-9, 1961. Sec., Raymond J. Faust, 2 Park Ave., New York 16, N. Y.

## Institute of Traffic Engineers

Sheraton-Park Hotel, Washington, D. C., Aug. 21-23, 1961. Write: David M. Baldwin, Institute of Traffic Engineers, 2029 K St., N.W., Washington 6, D. C.

## American Public Works Congress and Equipment Show

Municipal Auditorium, Minneapolis, Minn., Sept. 24-27, 1961. Sec.-Treas., Robert D. Bugher, 1313 East 60th St., Chicago 37, Ill.

## Water Pollution Control Federation

Milwaukee Auditorium, Milwaukee, Wis., Oct. 9-12, 1961. Exec. Sec., Ralph E. Fuhrman, 4485 Wisconsin Ave., Washington 16, D. C.

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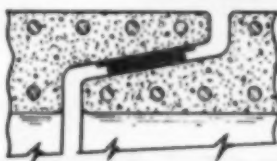
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**CONTRACTOR:** M. A. Bongiovanni, Inc., Syracuse, N. Y.

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#### Outline of Modern Water Treatment Equipment

248. Bulletin 44J<sup>2</sup> is recommended for engineers who need a basic refresher course on treatment of municipal and industrial water. It lists water impurities and methods of treatment and illustrates treatment systems and equipment. Check the reply card or write The Permutit Co., a Division of Pfaunder-Permutit Inc., 30 West 44th St., New York 36, N. Y., for your copy.

#### Offering a Handbook on Steel Pipe

309. This 40-page "Handbook of Tubular Products" contains dimensions, weights, test pressures, and specifications for Bethlehem continuous butt-weld and electric resistance-weld steel pipe. Standard and tentative specifications for welded and seamless steel pipe are also included. Address Bethlehem Steel Co., Bethlehem, Pa., or let us get it for you by circling card-number above.

#### Pipe Cutter for Cutting Large Size Pipe

254. An all-purpose pipe cutter that can cut pipe in or out of the ditch is described in a bulletin available from Ellis & Ford Mfg. Co., P. O. Box 308, Birmingham, Mich. Check the reply card for sizes and parts list.

#### Use The Reply Card

#### Book Tells

##### How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card

#### A Quick Comparison of Water Meters Helps

274. That is the purpose of the new bulletin describing the newest accomplishments in water meter design and manufacture. With it comes a Condensed Catalog of the Rockwell line. Ask for Bulletin No. W-811 from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa., or check the card.

#### Clew Bell-Tite Cast Iron Pipe

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#### Handbook on How to Lay Concrete Pressure Pipe

324. Manual on concrete pipe laying instructions is available from Price Brothers Co., Dayton, Ohio. Check the reply card for information on how to dig the trench and handle the pipe, make the joint and the pipe bedding procedure.

#### Floatless Liquid Level Controls

543. Catalog describes the B/W system of liquid level control, liquid level relays, electrodes, signals and alarms with descriptions, charts and diagrams of typical applications. Check the reply card or write B/W Controller Corp., Birmingham, Mich.

#### To Insert Valves Under Pressure . . .

555. . . let your first step be review of this "step-by-step" folder on Mueller tapping and cutting-in sleeves and valves. Write Mueller Co., Decatur, Ill., for Form W-5899 or circle number on our card.

#### Manual on Valves, Fire Hydrants and Accessories

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#### Bulletin Covers Step-by-Step Action on the Water Problem

609. A step-by-step outline of action telling how the responsible citizens can help their officials extend and improve the local water system through more adequate rate structures on financing is covered in this bulletin available from Thos. F. Wolfe, Managing Director, East from Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Illinois.

#### Water Filtration Costs Can Be Reduced

692. The "Cellite" system of diatomite filtration makes possible reduced installation cost, with space requirements a fraction of those for equivalent sand filtration. For informative literature write Johns-Manville, Box 16, New York 16, N.Y.

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128. Brush chipper features worth investigation are described in Mitts & Merrill Catalog 460. Advantages include ability to cut two sizes of chips. Catalog illustrates uses and gives specifications of "Beaver" Chipper. For your copy, write Mitts & Merrill, 1005 S. Water St., Saginaw, Mich., or check reply card.

### Self-Propelled Ditching Machines

438. Information on a self-propelled man operated ditching machine, model 324 T, model W-2 and a new midjet ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 324 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Model W-2 Ditcher digs from 2" wide up to 4" down to a depth of 30". Full data on these ditchers available by checking the reply card.

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146. Detailed cutaway drawings, specifications, diagrams, charts and money-saving reports and experiences are covered in catalog available from Fitchburg Engineering Corp., Dept. PW, Fitchburg, Mass.

### Epoxy Resin Adhesives for Concrete

186. Thiokol LP-3/epoxy resin concrete adhesives are especially suited for use in maintaining or repairing concrete structures. Check the reply card or write Thiokol Chemical Corp., Trenton 7, N. Y., for details on testing and application and working properties.

### Make Economy Part Of Your Fleet Operation

204. . . . by investigating the gasoline mileage, performance and safety advantages of the new '61 Lark. Get information on fleet experience by writing Fleet Sales Div., Studebaker-Packard Corp., South Bend 27, Ind., or by circling the reply card.

### Information on Boring Machines

268. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit are available in new bulletin just released by Earthworm Boring Machine, Inc., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included.

### Prompt Service on Sweeper Refill Fibers

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31. is good street lighting in preventing crime. To guide you to better lighting there is a new Kerrigan booklet, "A Bright City is a Safe City." Describes full line of lighting standards, also how to promote better lighting in your city and county. Address, Lighting Standard Div., Kerrigan Iron Works Co., 1033 Herman St., Nashville, Tenn. or use our card.

### Complete Catalog on Traffic Control Equipment

348. All types of controllers, PR system of coordinated traffic control, vehicle detectors, timers, vehicle counters and radar speed meters are covered in catalog available from Automatic Signal Div., Eastern Industries Inc., Norwalk, Conn. Check the reply card.

### Highway Hazard Warnings

345. Gathered in one booklet is practically the whole story on warning devices and how to use them. Catalog 55 is veritable gold mine of such information. Covers lanterns, flashers, torches, safety suggestions. For your copy write R. E. Diets Co., 225 Wilkinson St., Syracuse, N. Y., or circle card-number.

### Literature on Reflective Glass Beads

371. Glass beads for traffic signs and street name signs are described in literature available from FLEX-O-LITE MFG. CORP., 8301 FLEX-O-LITE DRIVE, P. O. Box 3066 (Afton Br.) St. Louis 23, Mo. No. 831 high index of refraction glass beads for white and yellow backgrounds and UH 68 medium index of refraction glass beads for reflectorizing dark colors such as red, green, blue, etc.

### Play Safe with Automatic Controls

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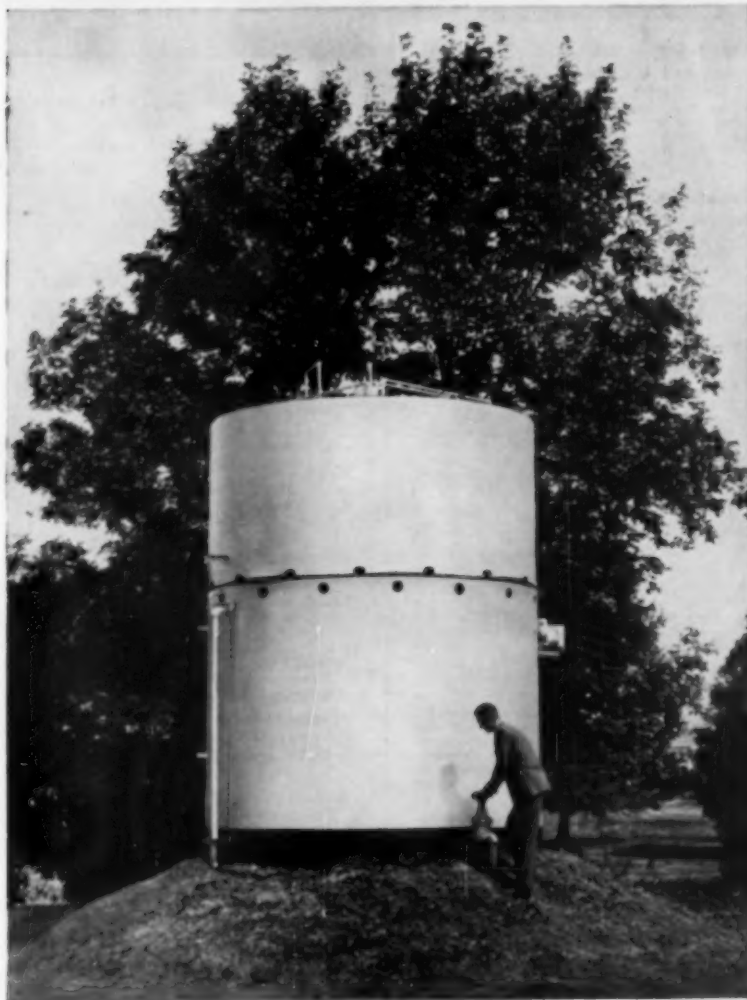
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## CONSTRUCTION EQUIPMENT AND MATERIALS

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### Tractors and Equipment for Municipal Use

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### Literature on

#### Concrete Gunning Equipment

695. The application of gunned concrete and allied equipment used for mixing the dry blend mix for this operation is described in Form No. C7-39, furnished by the Air Placement Equipment Company, 1000 West 23rd Street, Kansas City 8, Missouri.

### Catalog on Utility

#### Bodies and Equipment

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### How to Make

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455. A bulletin on how calcium chloride works in ice control and direction for its use has been made available by Wyandotte Chemical Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

### Plan for Bare Pavements

#### All Winter

470. Helpful folders on clear pavement winter maintenance by use of chemical mixtures are offered by Solvay Process Division, Allied Chemical Corp., 61 Broadway, New York 6, N. Y. Circle number on reply card.

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491. A plow is useless until it is hitched to truck or tractor. Versatile hitching equipment described and illustrated in circular offered by Kasten Mfg. Co., Allentown, Wis. Write them or check card number for your copy.

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### MASSACHUSETTS

James Huggins & Sons, Inc.  
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### MICHIGAN

Bituminous Materials Co.  
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Bituminous Materials Co., Eastland  
Bituminous Materials Co.  
416 S. Water St., Jackson

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Products Dept., 1980 East Ave., Rochester 10  
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**V**ERMEER MFG. CO.  
1439 W. WASHINGTON, PELLA, IOWA

## Municipal Power

### Electric Distribution System Losses

**BRUCE J. ENNIS**

Principal Engineer,  
Burns & McDonnell Engineering Co.,  
Kansas City, Missouri

IN ANY electric distribution system, the amount of energy put into the system is always in excess of the amount taken out and consumed for useful purposes. The difference between these two amounts constitutes energy losses and resultant economic waste.

In one typical city of 40,000 population, annual energy sales (representing useful consumption) amount to 51,000,000 kilowatt hours out of a total generated input of 56,000,000 kilowatt hours. The difference of 5,000,000 kilowatt hours per year is the loss inherent in the system, which, at an average price of one cent per kilowatt hour, amounts to an economic loss of \$50,000 annually. Obviously, much of this cost is part of the expense of doing business; however, the reduction of this cost to the economic minimum for the individual system presents a challenge for prudent management and design.

Just as no two electric distribution systems are identical with regard to size, operating voltage, system power

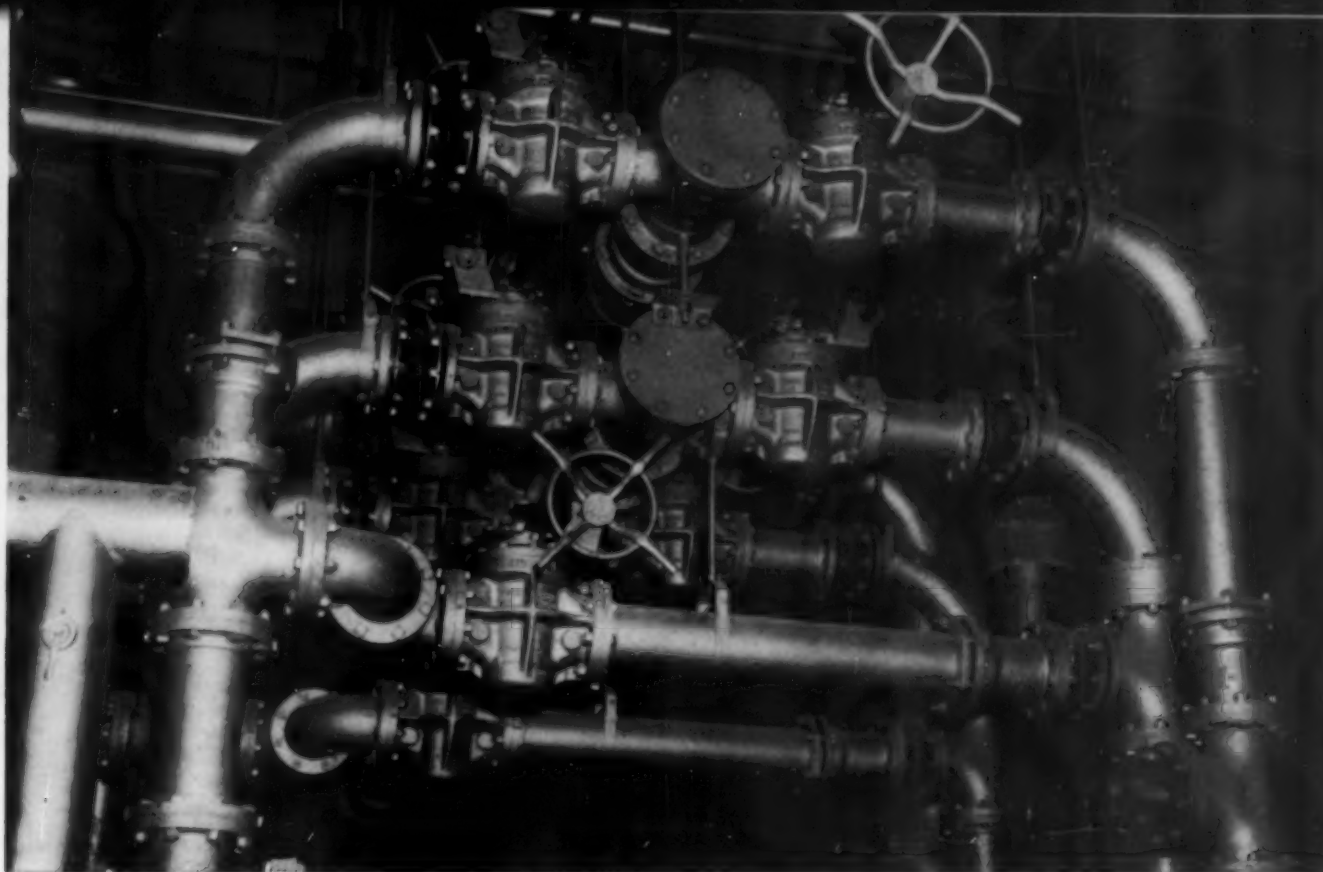
factor, consumer density and the like, so will the efficiency of energy distribution vary between given utilities. Annual system losses for typical urban distribution systems range from 4 percent to 16 percent, with a general average of 8½ percent; whereas losses in typical rural distribution systems will range from 8½ percent to 24½ percent, with a general average in the order of 12½ percent of the total energy put into the system.

To illustrate this inherent difference in system losses between two types of distribution systems, let it be assumed that an urban feeder and a rural feeder are each supplying an annual peak load of 2000 KW uniformly distributed along a 7.2/12.47 KV three phase pole line with No. 2 AWG copper conductors, as detailed in Table 1. In this theoretical example, the annual losses of the rural feeder are 5% greater than those of the urban feeder due to the lower consumer density, the greater length of circuit, and the smaller sized and less efficient transformers required to serve the loads.

If the line conductors were 2/0 copper instead of No. 2 copper size, the total annual losses would be reduced to 276,000 KWH or 3.15% for the urban feeder, and to 508,000

**Table 1—Individual Characteristics of Urban and Rural Feeders**

Item	Urban Feeder	Rural Feeder
Annual Peak Load in KW	2000	2000
Annual Load Factor in %	50	50
Power Factor in %	90	90
Operating Voltage in KV	7.2/12.47	7.2/12.47
Conductor Size, AWG Copper	No. 2	No. 2
Length of Circuit in Miles	4	20
No. of Consumers per mile	70	6
Distribution Transformers Number & Size	60-50 KVA	120-25 KVA
Annual Losses in KWH:		
Line Conductors	103,000	515,000
Distribution Transformers	224,000	252,000
Total	327,000	767,000
Annual Losses in percent of System input:		
Line Conductors	1.20	5.85
Distribution Transformers	2.55	2.90
Total	3.75	8.75



## CUT YOUR TOTAL VALVE COSTS WITH LUBRICATED PLUG VALVES

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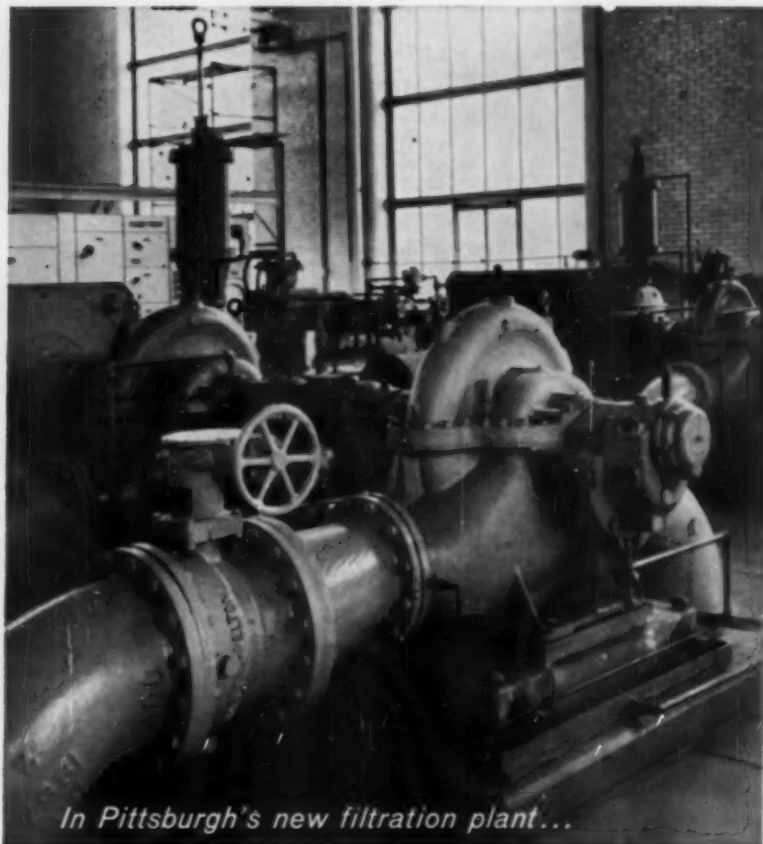
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help insure "heart of the plant" efficiency

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Sizes and types include 16" and 24" Darling-Pelton Butterfly Valves... and 6", 16" and 24" Darling Gate Valves with *revolving double disc parallel seats*. This exclusive Darling feature assures positive sealing and ease of operation at all times.

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KWH or 5.75% for the rural feeder. In this case, the losses in the rural feeder would only be 2.60% greater than those in the urban feeder; however, the net resultant savings in the operating expense for these two feeders due to the reduction in losses would have to include the additional fixed charges on the increased investment required for the larger sized conductors.

Based on catalog data for typical distribution transformers, the two sizes of transformers used in the example above would have losses somewhat as listed in Table 2. Core

**Table 2—Transformer Losses in Watts**

Rating, KVA	50	25
No Load (Core Losses)	259	142
Full Load (Copper Losses)	670	400
Total	929	542

losses, representing principally the energy expended in magnetizing the iron core of the transformer, take place at full value throughout each of the 8760 hours per year that the transformer is energized. Copper loss, representing the heat loss caused by load current flowing through the resistance of the transformer windings will vary hour by hour during the year in accordance with the square of the varying transformer load current, approximately.

In the case of the 25 KVA transformer, for example, the annual core loss will amount to 142 watts times 8760 hours, or 1240 KWH more or less. The annual copper loss, at 0.5 load factor, will be approximately equal to 400 watts, times 0.5 squared, times 8760 hours, or 876 KWH. The total annual losses per transformer will then be the sum of the constant core loss and the varying copper loss, or 2116 KWH. With the 120 transformers on the exemplary rural feeder described above, the total annual transformer losses would thus be equal to 252,000 KWH or 2.90% of the system input. At a load factor of only 40%, the transformer losses would amount to 3.07% of the system input due to the more predominating effect of the continuous core losses in the transformers.

Catalog data for another manufacturer of 25 KVA distribution transformers indicates typical losses of 128 watts no load, and 506 watts full load. If such a transformer were selected for this rural feeder, the total annual transformer losses at 50% load factor would be reduced from 252,000 KWH to 234,000 KWH and the total original rural feeders an-

nual losses would be reduced from 8.75% to 8.55%. Since the savings in annual transformer losses would amount to 18,000 KWH, the selection of transformers with the lower values of core and copper loss would permit savings in the order of \$180 per year for this particular rural feeder, based on an assumed energy cost of one per cent per KWH.

By giving consideration to the purchase of transformers with low total losses, and with the optimum ratios of copper loss to core loss for the anticipated load cycles in which the transformers will operate, it should be possible to effect reductions in total system transformer losses and improve distribution system efficiency.

Based on a power factor of 90%, the No. 2 copper urban feeder described above would have conductor losses in the order of 103,000 KWH, or 1.20% per year. If the power factor were only 80%, the conductor losses would increase by the ratio of the power factors squared, to an annual loss of about 130,000 KWH or 1.48%, and the operating expense would increase by \$270 per year.

This illustrates the advantages that may be gained through the installation of shunt feeder capacitors to improve system power factor and reduce copper losses on feeders presently operating at uneconomically low power factors.

For any given system, the principal fields for the investigation of methods to reduce distribution losses include: (1) the selection of distribution circuit conductor sizes for optimum economy, taking into consideration future as well as present circuit loading, and comparative fixed charges; (2) the purchase of efficient distribution transformers with the most economical ratios of copper loss to core loss conforming with system load factors; and (3) the installation of shunt capacitors to improve system power factor and reduce circuit load currents and copper losses.

#### • • • Aerosol Spectrometer Basis for Award

Among the recipients of "Clean Air Awards" for outstanding contributions to the fight for air pollution control in Los Angeles during 1959 was Dr. Alexander Goetz for developing a method of measuring aerosols and determining their effects. Dr. Goetz's aerosol spectrometer was described in his article in **PUBLIC WORKS** in February, 1959.

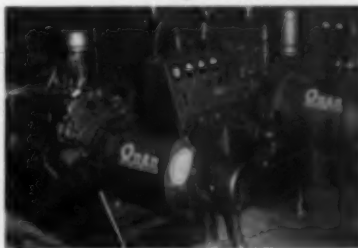


## Where else in this hospital is standby power important?

Any list of critical areas or services would include elevators, heating system, respirators, aspirators, oxygen tents, communications, x-ray equipment and various kinds of pumps. Interruption of electric power to any of these could be as vital to the patient as failure of emergency or operating room lighting.

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**The H-30 is the only unit** of this size and type which has as much built-in accessibility. The dip-stick, filler cap, batteries, connections and other service points can all be reached from ground level.

**The H-30 is the first and only** 4-wheel drive tractor-shovel that has special seals on all bucket and lower loader points to keep grease in, keep dirt out and reduce wear in these pivot locations.

**The H-30 is the only unit** of this size and type that has a single hydraulic bucket ram and a high-leverage linkage with a minimum of working parts. The hydraulic lines feature the maximum use of formed tubing and a minimum of hoses. All these refinements help to cut maintenance costs and increase reliability.

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12-B-1



THE FRANK G. HOUGH CO.  
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# HOUGH



**PAYLOADER®**

The new incinerator at Whitmarsh. Note the neat compact lines of the building and the low stacks of the wet scrubbers which emit a plume of steam. Glace & Glace, Inc. were consulting engineers for the project.

*new method lowers  
refuse disposal  
costs—gives  
communities*

## smoke-free, odorless, economical incineration

Communities across the country have experimented with various methods of refuse disposal. Their experiences amount to a test-in-actual-use of practically every approach to the problem. Today, backed by cost, convenience and long range land use considerations, many have gone to incineration as the best solution. This is especially true since a new type of incinerator now brings costs into line with most community budgets.

This new type of incinerator was adopted by Dravo Corporation after intensive research into the refuse and sludge disposal problems of communities of all sizes. The Dravo Incinerator provides almost completely automatic operation and reduces the

number of operators required. It takes full advantage of the latest materials handling techniques to eliminate litter. It utilizes modern combustion principles to eliminate smoke and odor. Each part of the system has been selected for rugged construction and ability to contribute to overall efficiency. Two of the most important parts are the storage conveyor and the furnace.

### THE STORAGE CONVEYOR.

Trucks are dumped indoors so that trash will not be scattered around the area. Refuse falls through an opening in the floor directly into the conveyor hoppers. The hoppers oscillate mechanically, throwing the material forward. This action is self-scouring and refuse does not stick to the sides or bottom of the hopper.

The refuse empties into feeders which charge it into the furnace. Automatically operated on a controlled time cycle, the feeders lock a layer of refuse against the furnace gates. This maintains an effective seal, permitting good control of furnace draft.

### THE WATER-COOLED FURNACE.

The furnace is constructed of first quality fire brick in which water filled cooling pipes are embedded on 8-inch centers. The cooling pipes maintain furnace wall temperatures below the slagging point of the refuse ash. This construction permits intermittent operation without the need for a long cooling period. In addition,



Partially loaded hopper. Walls and floor are kept clean by the oscillating action. The hoppers are mounted on air springs, which compensate automatically for the load in the conveyor.

tion, the walls are thinner, and refractory maintenance is reduced to a minimum. The higher combustion temperatures made possible by water cooling improves burning rate and eliminates noxious odors.

The Dravo Incinerator is the economical solution to the problem of sanitary, convenient refuse disposal. For full information, write or call DRAVO CORPORATION, PITTSBURGH 22, PENNSYLVANIA.

**DRAVO**  
CORPORATION



Water-cooled furnace during construction. The cooling pipes can be seen between the courses of refractory brick. Oil burners are used for ignition only; no additional fuel is needed to support combustion of refuse.

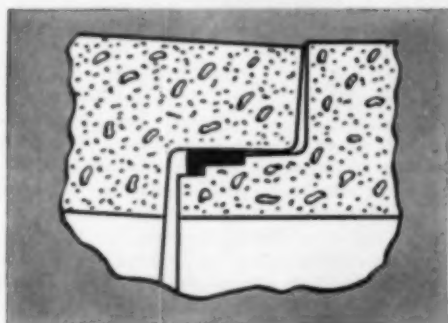
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# Flexible



Patented Joint—RE-24799



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Press-Seal confined compression type gaskets are vulcanized from a special high quality Goodyear compound, using new materials only.

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 PRESS-SEAL GASKET OF CANADA—KITCHENER, ONTARIO  
 PRESS-SEAL GASKET CORP.—10116 YACHT CLUB DRIVE, ST. PETERSBURG, FLORIDA

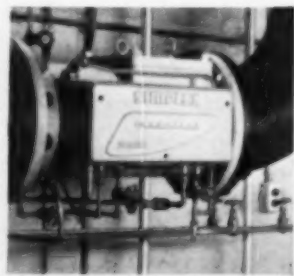
# Look what you won't need with your next flow controller



**NOW THERE'S A MODERN,** surprisingly simple way to control flow in your filter effluent piping. The Modulair "P" rate of flow controller, fully pneumatic, installs almost as easily as a piece of pipe, gives you accuracy with less "hardware" and attention than other types of controllers.

**SIMPLE!** Pre-assembled unit saves you money on initial cost and installation cost. Simplicity of design reduces maintenance almost to zero. All working parts are enclosed. No hydraulic valves or valve operator. No water supply needed. No drive gears or linkage. No complicated piping. No pilot valve. No floor drain.

**COMPACT!** Has the shortest laying length of any rate-of-flow controller. No appendages. Shown in the picture at the right is one of three Modulair controllers at the modern filter plant in Fairmont, Minnesota. Note the trim, clean installation, with no "spaghetti" of hydraulic piping, no appendages. Unit is simply "a box on a pipe."



**USEFUL, FREE BULLETIN.** The space saving, low cost and operating economies of the Modulair "P" are fully detailed on the pages of our Bulletin 951. Complete specifications included. Write for a copy—with no obligation on your part.

## SIMPLEX

VALVE AND METER COMPANY  
a division of PFAUDLER PERMUTIT INC.  
Lancaster, Pennsylvania

## Ed Cleary Says:

### Water Pollution Control Is At The Summit Level

**EDWARD J. CLEARY**

Diplomate, American Academy of Sanitary Engineering  
Cincinnati, Ohio

IT IS A SALUBRIOUS sign of the times to note that national governments are lending their prestige to the promotion of water-pollution control. In our own country the White House Conference scheduled for this month (Dec. 12-14), offers a high platform for the advocates of clean streams to debate the issues that confront this nation in maintaining the quality of its water resources.

Meantime, the governments of nations in both eastern and western Europe have crystallized plans for a ten-day conference on the economic and administrative aspects of water-pollution control. This precedent-setting European conference is scheduled for February, 1961, in Geneva.

A glance at the programs of both the national and international conferences suggests similarities in spirit and objectives. Everywhere there is dissatisfaction with the status of river-protection efforts. And there is confusion regarding goals and the manner of reaching them. These conditions create the proper atmosphere for the conduct of discussions. Dissatisfaction provokes identification of problems; and exchange of viewpoints will promote the possibilities for solving them.

#### Political Aspects of Pollution

The calling of these conferences does not imply that the problems of water-pollution control have not heretofore been under scrutiny. They have—but primarily on a professional level or scientific basis. As now evidenced by the attention of national governments, the issues are recognized to be of much broader concern.

Such recognition stems from the stark fact that control of pollution is not primarily a technological problem. It is an endeavor intimately associated with economic and social welfare of a nation. Therefore, the decisions to be made are political in nature—namely, an expression of public policy in terms of regulation and administration.

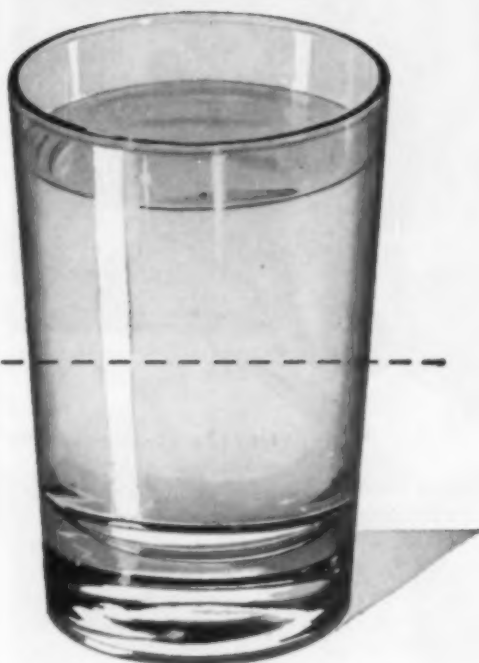
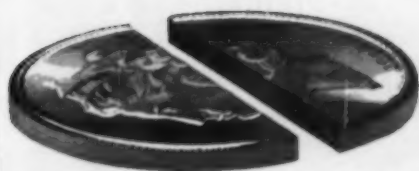
Certainly this was the motivation of President Eisenhower in calling upon the Secretary of Health, Education and Welfare to organize the White House Conference. It was the President's instruction to provide "a forum in which all concerned can confront and better appreciate their mutual responsibilities for solving this pressing problem [of water pollution]."

#### White House Conference Objectives

Under the direction of Frank A. Butrico, U. S. Public Health Service sanitary engineer, who has been detailed as executive secretary of the conference, a 35-member steering committee set forth these specific objectives for the Washington meeting: (1) To assess the status of the water pollution prob-

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**Increase**  
**clear water**  
**capacity**  
**100%** -----



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If you're considering water filtration for the first time, it makes good financial sense to go Celite® diatomite all the way. An actual test installation by Johns-Manville has proved that a diatomite filter station can be installed for 45% less than a sand filter station of equal capacity.†

What's more, Celite will usually give better water clarity under comparable conditions. Turbidity is far lower. More suspended solids, including all floc, amoebae and algae, are removed. And a Celite diatomite system is easily operated and maintained by regular municipal water personnel.

Mined from the world's purest commercially available deposit, Celite is carefully processed for complete uniformity. Call your nearby Celite engineer for complete information on Celite's wide range of grades; he will gladly assist with your particular problems. And write today for FREE informative reprint.‡ Johns-Manville, Box 14, New York 16, New York. In Canada, Port Credit, Ontario.

\*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.  
†Comparison Studies of Diatomite and Sand Filtration by G. B. Bell, Journal American Water Works Association, September, 1956.

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screw handle turns easily.

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# RIDGID

lem; (2) to pinpoint barriers presently standing in the way of progress; and (3) to reach agreement where possible on means and methods of advancing remedial action.

Expectations have been voiced that the White House Conference would result in the production of "a national blueprint for action." This is probably more than could be hoped for from a three-day conference. But it is reasonable to assume that our nation and its leaders will at least, have a more profound understanding of the "barriers presently standing in the way of progress." And this will represent a significant contribution in hastening more effective future action.

#### European Conference Objectives

The European conference had its origin in a resolution adopted by the United Nations Economic Commission for Europe at its Fourteenth Session in 1959. The delegates resolved that the time had come for an examination of water pollution control, with emphasis on its economic, administrative and legal aspects. The objective is to pave the way for action by governments, nationally and especially internationally, in dealing with problems of maintaining the cleanliness of rivers.

Accordingly, the ECE secretariat, in cooperation with the Food and Agriculture Administration and the World Health Organization, this spring completed an agenda for the conference. Topics and speakers selected indicate that this meeting will be of great significance not only to the European participants but to every nation in the world. Conditions that accentuate pollution potentials—concentration of population and industrialization—have existed in certain parts of Europe for a much longer period than in this country. It will be instructive to learn how such situations have been handled. And quite possibly we might find reason to revise our thinking, notably so with regard to the capacity of rivers for assimilation of wastes.

In the realm of pollution-control administration there are at least two outstanding examples of ingenious and effective European practice. Perhaps the longest record of experience is to be found in the operations of the Thames Conservancy. For more than a century this river-basin agency has been engaged, among other things, in safeguarding the quality of the Thames River. The policies and procedures that have been evolved for the successful execution of this tremendous task compel the attention of every student of pollution control.

Equally impressive are the accomplishments of the German river boards in the Ruhr Valley, some of which have been operating for 50 years. Of particular interest are the methods employed in financing river protection activities and in the assessment of costs among those benefited.

#### What About Russian Practice?

Less is known about the practices in the eastern European countries—a situation that prompted the editor of *PUBLIC WORKS* recently to publish an editorial (October 1960) titled: "Are the Russians Ahead on Stream Pollution Control?" There is reason to believe that the editor may find some answer to his query in one of the papers to be presented at the European conference.

Dr. Y. D. Lebedev, deputy chief state inspector of health of the USSR Ministry of Public Health, has undertaken the task of collating information from

# Concrete Adhesives With THIOKOL Liquid Polymer MAKE LITTLE OF BIG REPAIRS



1.

Scaled highway surfaces are being lastingly repaired in only a few hours by bonding new concrete to old with adhesives containing THIOKOL polysulfide polymer. The bond is stronger than concrete itself. Field and lab tests prove it.

**PROOF POSITIVE**



2.

Only loose and damaged concrete—not the whole slab—need be removed. The adhesive also cuts time and costs in repairing spalled areas, cracks, pot holes, in skidproofing and sealing, in fastening traffic markers. Results are long-lasting.



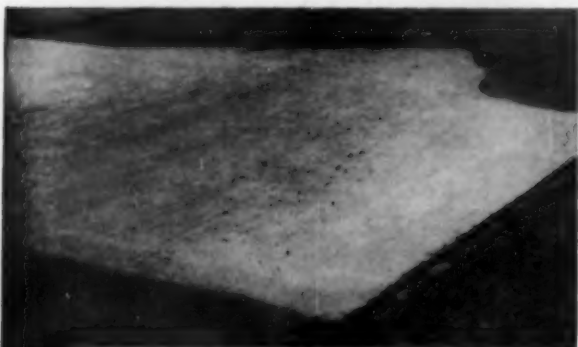
3.

Adhesive with THIOKOL liquid polymer—made and sold commercially by several processors—is spread on prepared surface with brooms or heavy brushes. Thirty minutes later, while adhesive is still tacky, new concrete is poured.



4.

Concrete is laid conventionally. It can also be worked out to a feather-edge without danger of later failure—so tenacious is the adhesive bond of new to old concrete.



5.

Repair completed—road open as soon as concrete is cured. Similar repairs, in service since 1953, show no damage or effects of weather, wear and tear, even on the busiest highways.

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New Type of Concrete-to-Concrete Bonding."  
Tells how to reduce remedial time and costs, and  
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## Keep pavements bare all winter with Solvay Calcium Chloride

—SALT MIXTURES



This winter use the method of leading turnpikes that achieve "no shut-down" records despite the severest weather.

Combine Solvay® Calcium Chloride with salt. Make sure you have ample stocks on hand, at money-saving bulk rates.\* It can be stored alone, or mixed with salt, outdoors under tarpaulin covers, in indoor sheds or covered bins.

Bulk handling of Solvay Calcium Chloride is a one-man operation, both in loading and application. It can be used economically by large and small highway departments.

Calcium chloride-salt mixtures are effective at all temperatures and humidities. While salt's best range is 25-32°F., calcium chloride speeds melting at all temperatures, even down to below zero... provides the moisture salt needs to act. Calcium chloride liberates heat as it melts ice, which helps salt work faster. When you combine the two, applications can be lighter and less frequent. This reduces chemical consumption and lowers cost.

For instant skidproofing of icy surfaces, treat abrasives with Solvay Calcium Chloride. They hold fast in wind and traffic at all temperatures.

\*Also available in moistureproof bags.

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Russia as well as from certain nations adjacent to Russia, on the status of pollution control. If his general survey matches, in depth and detail, that prepared a few years ago by Dr. Arthur Key, senior chemical inspector of the United Kingdom Ministry of Housing and Local Government, on the situation in western Europe (which will be brought up to date for the Geneva meeting), it will be illuminating.

All in all, the White House Conference this month, and the one to follow in Europe gives clear indication that water pollution-control has been projected to a level of highest importance in national and international affairs.

## Engineering Notes

### Cost of Refuse Collection and Disposal

The city of Newton, Mass., collected 32,755 tons of refuse during 1959 at a cost of \$8.55 per ton; and incinerated 30,660 tons at a cost of \$3.32 per ton.

Detroit, Mich., collected 3,068,145 cu. yds. of rubbish in 1959, and disposed of it at a total cost for collection, incineration and landfill of \$3.74 per cu. yd., or \$5.91 per capita. There were 348,550 tons of garbage collected and disposed of at a cost of \$15.39 per ton or \$2.76 per capita.

Snyder, Texas, reports an analysis of cost of commercial refuse collections, using one vehicle, a driver and two helpers, as follows: Driver \$305 per month and helpers, each, \$295 per month. For the following items, the charge against commercial collection is based on one-third the total: Superintendent \$135; dump ground operator \$66.67; employees benefits \$293; motor vehicle supplies \$62.75; maintenance of motor vehicle \$122; depreciation on truck and equipment \$172; miscellaneous expense \$2.75. Total cost per month about \$1750.

### A Zetapotential Philadelphia Story

One of the lesser known stories resulting from the WPCF convention in Philadelphia, concerned a man dedicated to his art. A model flocculating tank in one of the exhibits was not functioning to the best advantage. This was called to the attention of Thomas M. Riddick who promptly attributed it to the fact that the floc which had been produced was strongly electro-negative. He confirmed this by measuring the Zeta potential of the alum floc and prescribed a polyelectrolyte dosage which lowered the electro-negative charge of the coagulant, resulting in satisfactory flocculation.

Mr. Riddick has developed the necessary instrumentation to evaluate the Zeta potential phenomenon. He applied it for the first time to control coagulation at the new Waterford, N. Y., water treatment plant, which uses the polluted Hudson River as a source. Komline-Sanderson Engineering Corporation is licensed to build and market the basic measuring instrument which is to be known as the "Zeta-meter."

### New Highway Research Board Committee

A new committee better to acquaint the public with important findings in highway research has been established by the Highway Research Board.

Pyke Johnson, chairman of the Board, has an-

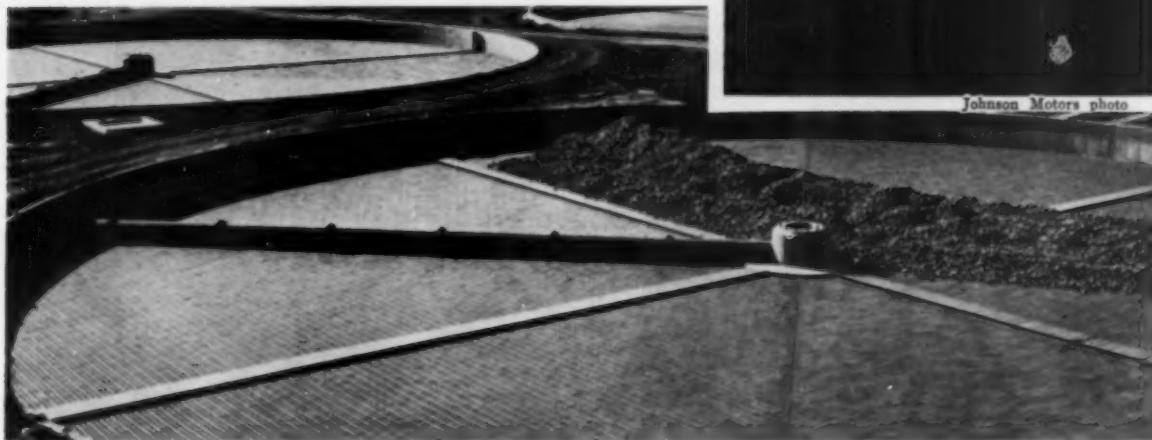
# Water sports follow clean waters

## Trickling Filters with TFFI Clay Underdrain Blocks promote clean waters

Economy, efficiency and flexibility are major factors back of the steady swing to trickling filters. Between 1945 and 1957 alone 926 of them were built, and the construction rate continues unabated. Many old trickling filters are operating as well today as when first installed, thirty and more years ago. Their design accommodates future expansion easily, and provides a high degree of continuing service in treating sewage and industrial wastes.



Johnson Motors photo



### Clay underdrains offer lowest final cost

An outstanding feature of their success is the TFFI Specification clay underdrains. As manufactured by the members of this Institute, they best resist the ravages of acids, alkalis and bacteriological action. Also, they alone offer a 50-Year Guarantee, made possible by manufac-

ture in modern plants under rigid controls of quality that no substitute material can approach.

First cost thus becomes final cost, making TFFI clay blocks the lowest cost filter floor in the end.

### Demand Certified Underdrain Block

Vitrified Clay Block manufactured by the TRICKLING FILTER FLOOR INSTITUTE members and tested by the Materials Testing Laboratory of Rose Polytechnic Institute comply with or exceed ASTM Specification C 159-59T. If you lack a copy, write any member for yours as contained in the new TFFI Handbook.



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Beverly Shale Co.  
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W. S. Dickey Clay Mfg. Co.  
Kansas City 8, Mo.



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Pittsburgh 22, Pa.  
257 Fifth Ave.  
Hatch Corporation

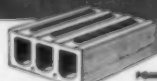
## TFFI Trickling Filter Floor Institute



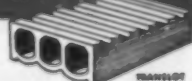
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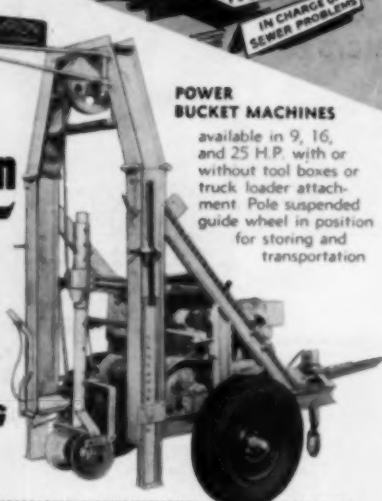


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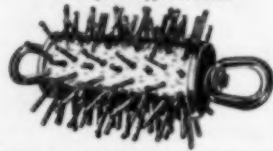
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We built the first  
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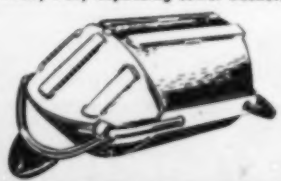
**Adjustable Pipe Line Scrappers**



**Porcupine Type Brushes**



**Heavy Duty Expanding Sewer Buckets**



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OF EQUIPMENT NEEDS**



nounced that John W. Gibbons, director of Public Relations for the Automotive Safety Foundation, will serve as chairman of the newly formed Committee on Public Dissemination of Research Findings. Major duty of the Committee will be to provide media of public information with major results of the research reports presented to the Board in all phases of highway transportation through a planned editorial program.

Serving on the Committee are a number of nationally known organization officials and public relations directors. They include:

Michael O. Chenoweth, Director of Public Relations, American Society of Civil Engineers, New York 18, New York; Wm. R. B. Froehlich, Chief Deputy Secretary and Chief Engineer, Pennsylvania Department of Highways, Harrisburg, Pennsylvania; Bernard F. Hillenbrand, Executive Director, National Association of County Officials, Washington 6, D. C.; Robert M. Monahan, Special Assistant to the Federal Highway Administrator, United States Bureau of Public Roads, Washington 25, D. C.; John E. Moore, Manager, Public Information Department, National Highway Users Conference, Washington 4, D. C.; John H. O'Brien, Editorial Department, *The Detroit News*, Detroit 26, Michigan; Wilber E. Smith, Assistant Director, American Municipal Association, Washington 6, D. C.; Earle Steele, Manager, News and Information Department, Chamber of Commerce of the United States, Washington 6, D. C.; Richard Tupper, Associate Director, Public Relations Department, American Automobile Association, Washington 6, D. C.; Paul Wootton, Chairman, Executive Committee, Society of Business Magazine Editors, Washington 4, D. C.; Randolph Russell, Director of Public Relations, American Road Builders' Association, Washington, D. C.

Consultants to the Committee include: James Cope, President, Selva and Lee, New York, N. Y.; Harmer E. Davis, Director, Institute of Transportation and Traffic Engineering, University of California, Berkeley 4, California; E. H. Holmes, Assistant Commissioner for Research, U. S. Bureau of Public Roads, Washington, D. C.; Kenneth Youel, Director of Divisional Relations, Public Relations Staff, General Motors Corp., Detroit 2, Michigan, and President, Public Relations Society of America.

Highway Information Services, of Washington, D. C., has been retained by the Board to help implement the publicity program developed by the new Committee.

**Cost of Prisoner Labor on Road Work**

The detention camps operated by Los Angeles Co., Calif., reported a total of 134,946 "prisoner population days" for the 1958-59 fiscal year, as compared to 129,982 in the preceding year. These prisoners were employed as county road department work and the total cost aggregated \$4.80 per prisoner per day for the road department and 79 cents per prisoner per day for the sheriff's department, a total cost of \$5.59 per day for prison labor.

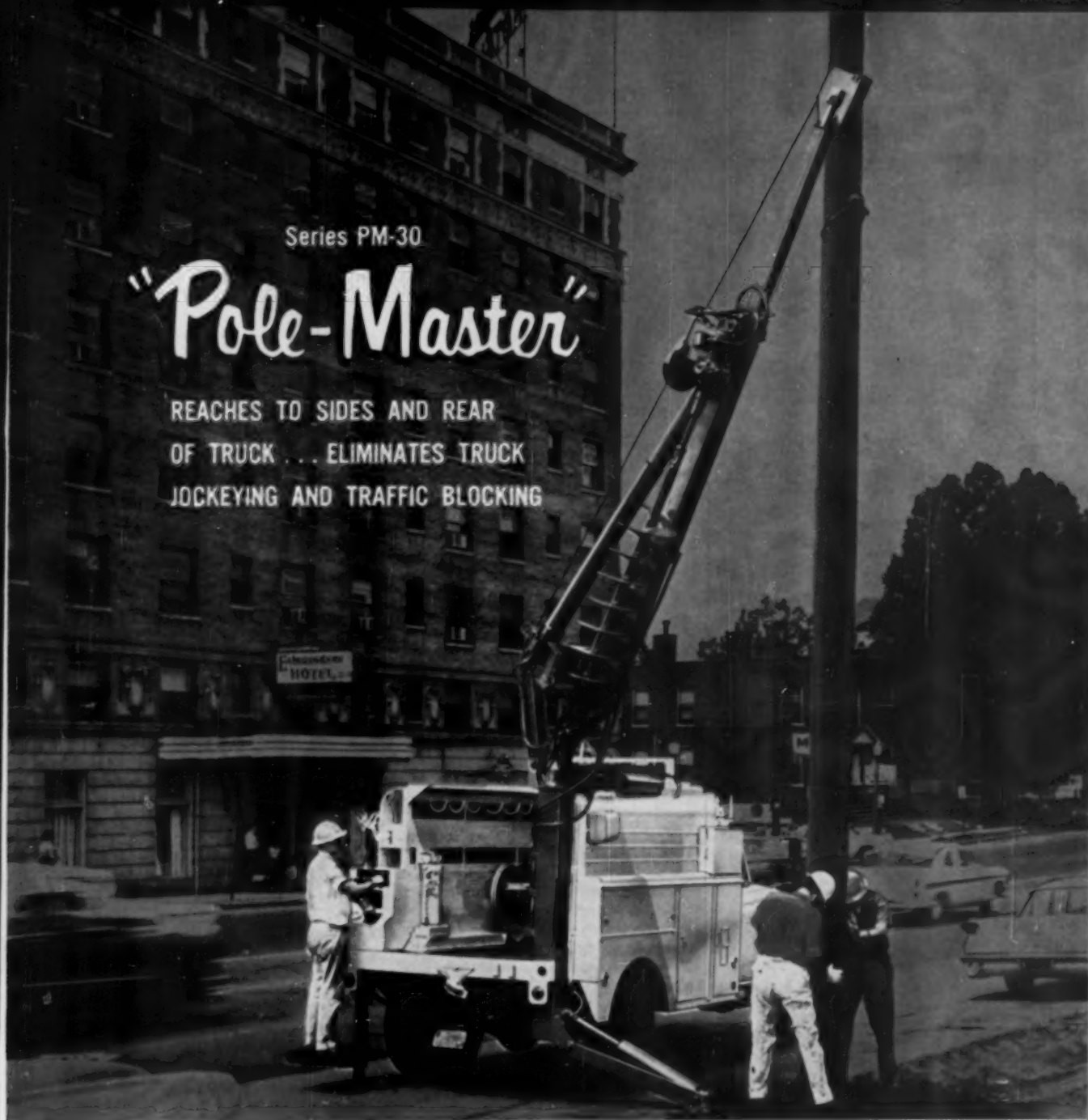
**Sewage Treatment in Henrico County**

There are 14 sanitary districts in Henrico Co., Va. Serving these are 7 sewage treatment plants, 25 sewage pumping stations and 209.55 miles of sewers with 16,134 active sewer services. Districts not having their own plants discharge to the Richmond sewer system. Most of the district plants provide complete treatment. The population of the county in 1959 was estimated at 106,000.

Series PM-30

# "Pole-Master"

REACHES TO SIDES AND REAR  
OF TRUCK ... ELIMINATES TRUCK  
JOCKEYING AND TRAFFIC BLOCKING



**POWERS**

*American* offers the only corner-mounted oscillating hydraulic derrick available in sizes for handling 40', 55' and 70' pole-setting jobs with fewer men. The PM-30 can be installed on either rear corner on any style body ... spots anywhere in a horizontal arc extending from one side of body to the other ... body loads and reaches low for efficient digger operation without auger extension.

Hydraulic head sheave extension on 55' and 70' units increases reach — stretches out to hoist or dig across gullies and fences. PM-30 safety and convenience features include underfloor winch line, electrically-isolated operator platform, four-ton capacity, positive load locking in event of line failure, tremendous turning and holding power.

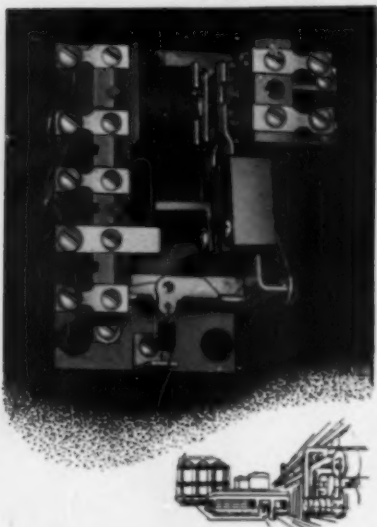
*Descriptive literature and price information is yours for the asking!*



*Optional self-stowing Series DF-1 "Earth-Master" Hydraulic Digger automatically attaches to sheave extension for use, stows out of way when not in use. Requires no pinning. Telescopic tubing to drive assembly eliminates cumbersome hydraulic hose. Digs up to 24" in diameter and 10' 6" in depth.*

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## LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

### Expansion of Park, Water, and Sewage Facilities

*Eakley v. City of Raleigh*, 114 S.E. 2d 777, a North Carolina case decided June 10, 1960, was an action by a taxpayer to enjoin the issuance and sale of bonds by the City of Raleigh for park, water and sewer facilities.

The City Council, when it passed the bond ordinance, contemplated the annexation of additional territory, and the expenditure of a portion of the bond money in the annexed territories subsequent to annexation. The taxpayer contended that this rendered the bonds invalid.

The court held that the bonds were not invalid, and that the expenditure of money for these purposes in the annexed areas after annexation was also proper.

The court also held that it was proper for the City to spend money on parks and recreational facilities and on sewer and water lines in the areas in question even before annexation, provided this was for the direct benefit of citizens of the City. However, expenditures outside the existing city limits are improper if they are for the purpose of financial gain.

### Housing and Redevelopment

*Housing and Redevelopment Authority v. Minneapolis Metropolitan Co.*, 104 N.W. 2d 864, a Minnesota case decided August 5, 1960, was a condemnation proceeding by the Housing and Redevelopment Authority of the City of Minneapolis. The landowner asserted that the condemnation was improper, because the Municipal Housing and Redevelopment Act limits the use of redevelopment areas to housing, and does not permit the use of the land for commercial and industrial purposes, as proposed by the contemplated urban redevelopment project known as "Gateway Center Urban Redevelopment Plan." It also

argued that it should be excepted from the redevelopment plan.

The plan provides for new rights-of-way and easements, new land uses, street adjustments, new utilities, together with directions as to landscaping, zoning uses, building area ratios, building requirements, parking facilities and signs. The entire area consists of 20 city blocks. The Metropolitan Building, a 12-story office building of monumental character, is in this area, and was sought to be condemned for use in connection with the project.

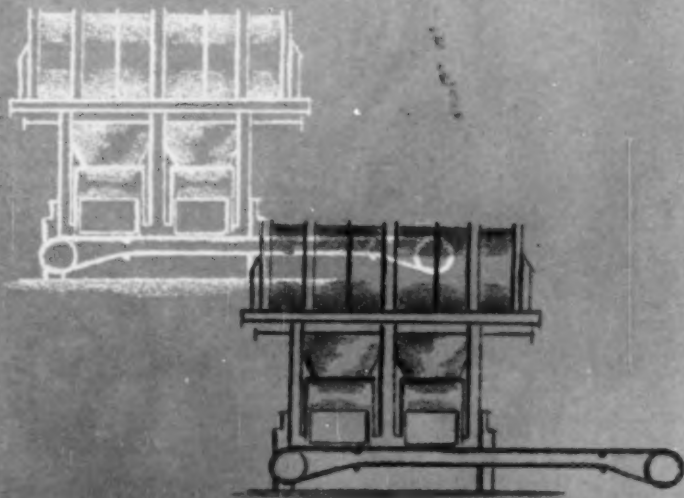
The report submitted to the Authority by its consulting engineer indicated that an expenditure of about \$1,200,000 would be needed to "rehabilitate" the structure, and that it would then still be incompatible with the plan designed for the renewal area. He recommended that the building be demolished.

The inspector of buildings also submitted a report to the Authority, which stated: "It is my opinion that the action of time and the elements is disintegrating the exterior at a faster rate than the maintenance is arresting. If the required degree of maintenance were given the exterior, it would be so costly as to render the retention of the structure an economic failure." He also pointed out that in his opinion "... the structural makeup of the building is such as to be far below present day engineering standards and a similar design (structural) would not be permitted today for a 12-story building." The supporting document also stated: "The obsolete exterior would stick out like a sore thumb in the redeveloped area. Because of the nature of the wall and the costs involved, the wall surface does not lend itself to visual improvement. There is no way economically to rehabilitate the building or to make it more presentable. Age and construction type combine to make this an undesirable building."



MODEL DAM BY R. S. BALDWIN

When it comes time to appoint a trustee or fiscal agent for revenue bonds, The Chase Manhattan Bank is at the service of state, county and municipal authorities. Chase Manhattan has the staff and experience to handle this function as trustee or fiscal agent in cooperation with banks in the areas where the projects are located. For complete details write: Corporate Trust Division, The Chase Manhattan Bank, 40 Wall Street, New York 15.



## NICHOLS "ROTO-PLUG"

### lowers installation costs

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The Nichols "Roto-Plug" Sludge Concentrator lowers installation costs by eliminating expensive vacuum and filtrate equipment, chemical mixing and feeding equipment, and conditioning equipment.

The "Roto-Plug" reduces operating costs because it dewateres sludge "as is", eliminating high chemical conditioning costs and high filter media maintenance.

For full details of the "Roto-Plug" write for a copy of our 4-page folder RP-100.

# NICHOLS

Engineering & Research Corp.

80 Pine Street, New York 3, New York

3513 N. Mervey Street, Indianapolis 18, Ind. • 405 Montgomery Street, San Francisco, Calif.

There was evidence to the effect "that time and the elements had taken their toll and had so far deteriorated the stone on some of the upper floors that pieces had fallen away." The company presented evidence that this condition could be controlled by a sandblasting and a tuck-pointing job and with proper future maintenance.

The court found that "there is merit in the structure as an historical piece," but that "the building is indisputably out of date and would to some extent be out of place in the project area." It was held that the Authority had power to undertake a redevelopment plan which made no provision for and included no housing. The Authority has power over both housing projects and urban redevelopment projects. It was also held that the taking of the Metropolitan Building was not arbitrary, unreasonable, or capricious, and that it was for a public purpose.

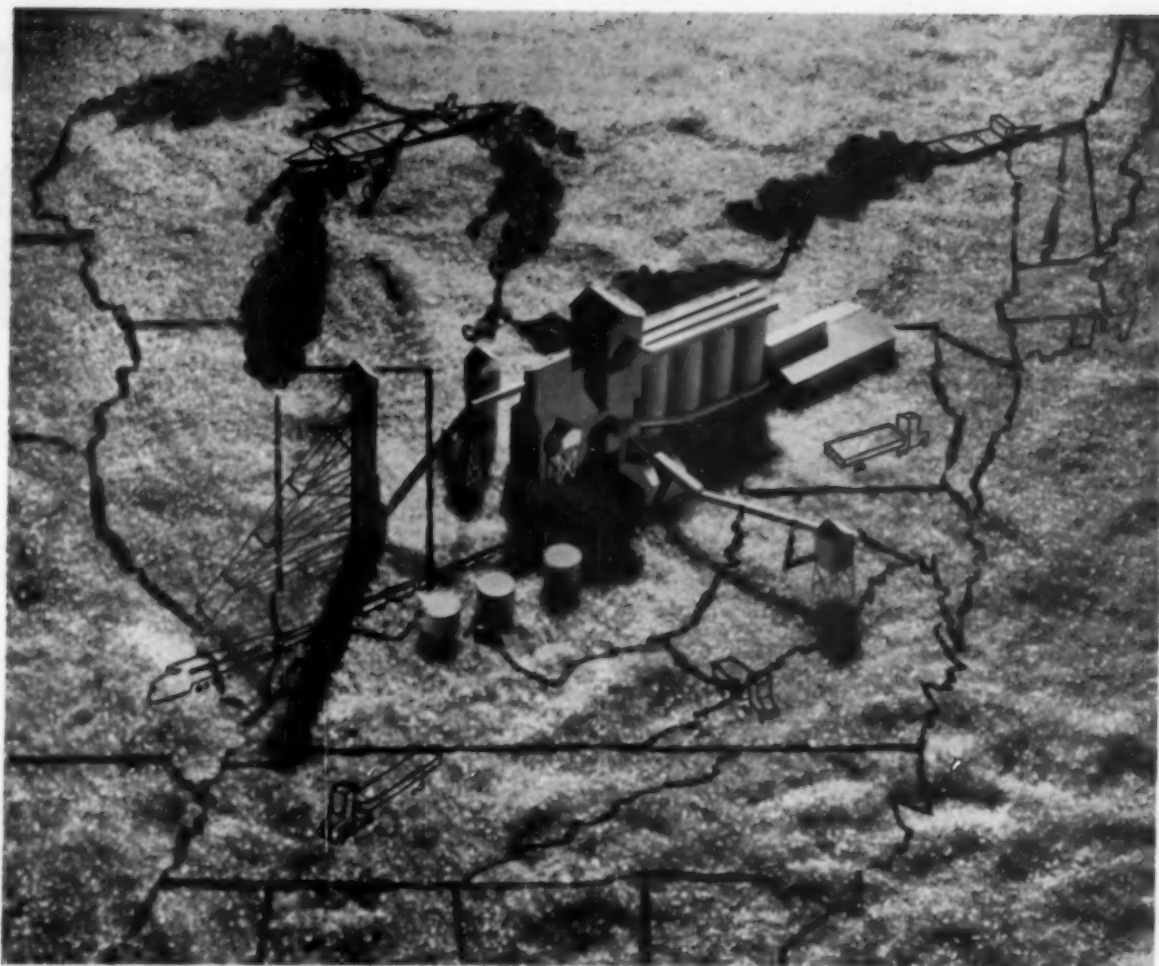
The condemnation was therefore approved.

• • •

### Desanding Well Water

It frequently occurs, when bringing in a new water well, that the first flow of water is contaminated with mud or sand or both. In some areas, where water is plentiful, this presents no problem as the first flow from a new well is wasted. In other areas, such as around Phoenix, Arizona, the first well water must be used if at all possible. Add to this the fact that water from new wells in the Phoenix area will contain sand for an indefinite period, and the problem becomes even more serious.

The Good Samaritan Hospital in Phoenix brought in a new well and attempted to use the water in the air conditioning system, with the result that the system had to be shut down at frequent intervals to clean the sand out of the coils. This was not only expensive, but resulted in patient discomfort during air conditioner down-time. This experience resulted in an installation of two Krebs (Wemco) Cyclones. Now, a 200-HP water pump brings water from the 375-foot well at 2400 GPM through a 12-in. pipe at 60-65 psi. The water (and sand) is split to the two cyclones through 6-inch inlet pipes. At the original cutting-in of the cyclones, sand recovery from the water amounted to nearly a truckload a day. This is now about one cubic foot per day under normal operating conditions.



## A new mine at Fairport, Ohio, is another reason it pays to order Safe-T-Salt\* from Morton

Located 29 miles east of Cleveland on Lake Erie, Morton's Fairport Mine offers a convenient source of SAFE-T-SALT (rock salt) for the snow belt cities of the East and Midwest. This new mine can deliver SAFE-T-SALT by boat to all Great Lakes ports and by truck and rail to inland customers.

The new Fairport Mine is but one of several strategically located sources of Morton SAFE-T-SALT, assuring Morton customers prompt, dependable delivery in time for winter.

**Be ready all winter—keep plenty of SAFE-T-SALT on hand**  
Now is the time to check your supply of Morton SAFE-T-SALT for ice and snow removal. You'll want sufficient quantities in stock so you don't get caught short in the event of late snow storms or a prolonged winter like last year. Your Morton representative can advise you on the best way to stockpile Morton SAFE-T-SALT without loss or inconvenience. Any salt remaining at the end of winter can be put to excellent use in summer road stabilization projects.

MAIL COUPON TODAY!

☐ Please send me your new booklet on ice and snow removal.

Name \_\_\_\_\_  
(Please Print)

Title \_\_\_\_\_

Company \_\_\_\_\_

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City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

\*Safe-T-Salt is a trademark of the Morton Salt Company

**MORTON SALT COMPANY**  
INDUSTRIAL DIVISION

Dept. FW12, 110 N. Wacker Drive, Chicago 6, Ill.



# **“K&M” ASBESTOS-CEMENT LAYS AS FAST AS**



Assembling 16" "K&M" Asbestos-Cement Pressure Pipe by hand without the aid of a bar. The backhoe merely steadies and aligns the pipe. The easy, two-step operation consists of (1) lubricating the tapered end of the pipe, and (2) sliding pipe into coupling.

## PRESSURE PIPE

# A SHOVEL DIGS...

**G&B Construction, Inc., Youngstown, Ohio, installs 4½ miles of "K&M" Asbestos-Cement Pressure Pipe for the Austintown District of Mahoning County, Ohio**

*"You can lay 'K&M' Pipe as fast as a shovel can dig. There is nothing that will hold you back with this pipe. When you can lay a 16" water line, and it goes in as easy as an 8" water line, what more could you ask? They've got a good joint with that FLUID-TITE® Coupling... the pipe is wonderful to put together. Of all the 'K&M' Pipe we've laid, we never had a coupling break."*

Those are the comments of Louis Gulfo, partner with Mike and James Bertilacci in G&B Construction, Inc. They installed "K&M" Asbestos-Cement Pressure Pipe in bitter cold, during February and March 1960. However, neither rain, snow, nor mud interrupts the installation of

this modern pipe. The exclusive, patented "K&M" FLUID-TITE Coupling and the simple fitting procedures required make assembly easy.

Little or no maintenance will face Mahoning County, which built and will operate the system for a year, or the City of Youngstown, Ohio, which will then take it over. Being non-metallic, "K&M" Asbestos-Cement Pressure Pipe won't rot, corrode, or tuberculate, and is immune to electrolysis. The suppliers of this pipe were Trumbull Plumbing Supply Co., Warren and Youngstown, Ohio.

Now, in addition, you may use quality "K&M" Plastic Pressure Pipe in the same system with "K&M" Asbestos-Cement Pipe, if desired.

Write today for more information on "K&M" Asbestos-Cement Pressure Pipe to: Keasbey & Mattison Company, Ambler, Penna. Dept. P-7120.



## Keasbey & Mattison at Ambler

Left to right: Louis Gulfo, G&B Construction, Inc.; Dale MacCleary, sales manager, Trumbull Plumbing Supply Co.; James Bertilacci, G&B Construction, Inc.; Burke Lyden, Asst. Chief Engineer, Youngstown, Water Dept.; Jim Bisciglia, Asst. Engineer, Mahoning County, and J. Henry Painter, Trumbull Supply Company.



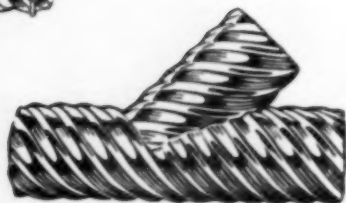
3 miles of 16" "K&M" Asbestos-Cement Pressure Pipe were installed. Here, we see it ready for installation along Webb Road, in Austintown Township. In branching from the 16" water line, Mahoning County used 1 mile of 12" "K&M" Asbestos-Cement Pressure Pipe and ½ mile of 8" "K&M" Asbestos-Cement Pressure Pipe. Specifications call for 90 lbs. pressure when line is in operation serving 16,000 residents.



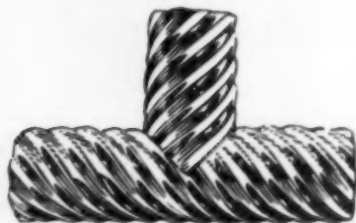
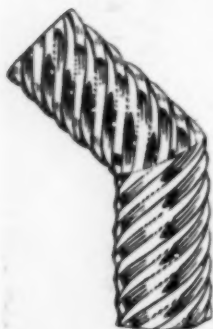
*So dependable, you install it...and forget it...*



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Lok-Cor . . . so dependable it can be installed for removal of ground water with complete assurance that the system will function indefinitely without maintenance. It's there to stay. Put Lok-Cor under shifting loads, or under severe freezing

and thawing conditions. It will not unravel or become disconnected to interrupt service.

Check over the many other quality features (see list below) that make Lok-Cor the new leader in subdrainage pipe. Then look for the double lock seam the next time you buy subdrainage. Send coupon for complete information, or contact your nearest Republic Drainage Products Distributor.

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- Economical . . . easy to install
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*Irvin Williams, Equipment Operator, Street Dept., Rolla, Missouri*



The economical record of Caterpillar equipment owned by Rolla convinced the city officials to purchase a new No. 12E Motor Grader. It will be used for cleaning ditches, mixing and laying road material on the city's 50 miles of streets.

Operator Irv Williams and Superintendent of Streets Bill Carroll are both enthusiastic about their new Cat Grader. But then that's understandable because the new No. 12E really is out front in Motor Grader performance.

Here are a few of the reasons: A new, compact engine provides greater lugging ability in tough going. It's designed for long life and easy servicing. Horsepower rating is still 115, but this new engine develops higher torque and gives the No. 12E greater load-handling capacity. A new two-cylinder vertical starting engine replaces the horizontal type, providing positive in-seat starts in any weather. The dry-type air cleaner is now standard, too. It removes at least 99.8% of all dirt from intake air, cutting maintenance time by as much as 70%.

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These are just a few of the reasons why the No. 12E is a better investment for your tax dollar. For the complete picture see your Caterpillar Dealer. A demonstration will specifically show you how the new No. 12E pulls through the tough going!

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# Providing Community Facilities In New Subdivisions

**J. L. BROWNLEE**  
Administrative Assistant to the  
City Manager  
City of Fort Worth, Texas

**B**ILLIONS of dollars will be spent in the construction and maintaining of streets, water and sewer lines, and the other community facilities that will be needed to serve the new homes built in the United States during the next ten years. In many communities, the municipal tax structure for decades will be partially shaped by the formula adopted now for dividing the cost of community facilities between municipalities and developers and by how well the needs of urban life are met at the time new subdivisions spring up.

Estimates are that in the next decade the home building industry will produce the equivalent of a city the size of Chicago once every two years. Essential to each home will be streets, water mains, sewer lines, and storm drains. Further, home owners in new areas will expect to be provided with adequate street lighting, parks and recreational areas, and the other facilities that mean the difference between urban sprawl and comfortable urban living.

## Problems and Solutions

The problems of providing these facilities can be broken into two parts. One is the engineering and planning challenge. It is one of designing and seeing through to completion, facilities that not only seem adequate at first glance to an inexperienced home buyer, but also serve area and community needs throughout the years. The second problem is that of financing. Although the cost of community facilities on a per-lot basis is a reason-

able one, when a demand is created for simultaneous development of many lots, an enormous financial burden can be placed on the city not ready with an equitable basis for distributing costs between the

city-at-large and the developer and/or home buyer.

Basically, these problems are a by-product of growth. A larger and more prosperous population in the United States has produced a de-



● MODERN metal light standards will grace most new residential subdivisions in Fort Worth, Texas, under the policy calling for installation of street lights.

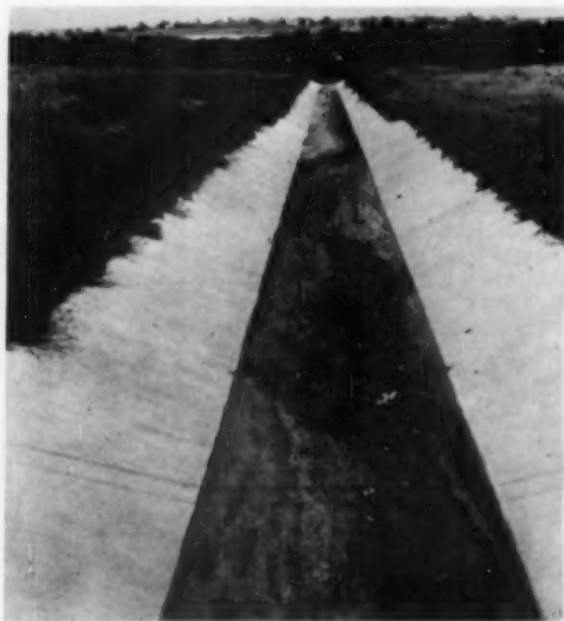
mand for new homes which will probably intensify during the next decade. As the standard of living of the American people rises, they desire and expect better homes, better neighborhoods, and better municipal facilities. Because this growth has been most evident since the end of World War II, the importance of developing the solutions to the engineering and financial problems arising from the need for community facilities in new additions has been apparent for a relatively short period.

During this time, three general approaches have been utilized by

home builders in necessary community facilities is being required. This approach has proven successful in the cities that have faced and surmounted the challenges and the problems of growth. It is based on a recognition that most community facilities are essential to the developer if he hopes to sell his homes and that other facilities are important to the individual home owner and will soon be demanded by him if they are not provided originally. Because a major part of the benefit gained from these facilities accrues to the newly-built neighborhood, there is a growing

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● WEED-FILLED open ditch, like that at the left above, is a component part of many municipal storm drain systems. In Fort Worth, concrete lined channels, right above, are being built wherever storm runoff exceeds the capacity of an 84-in. pipe.

American cities in dealing with the problem of financing and building community facilities. Some cities attempt to finance all, or nearly all, of the cost of extension of water and sewer lines, street lights, storm drains, and, occasionally streets. This approach is most often found in cities with minimum growth. Major cities ringed by residential suburbs, without room for residential growth, and smaller communities with a stable population and no immediate prospects for expansion, form the bulk of cities in this category. The financial burden that accompanies appreciable municipal expansion is usually enough in itself to force a revision in those policies that call for city financing of facilities.

A second approach, too frequently adopted as a way to meet—or per-

haps avoid—the problem, is to provide for construction of only the bare minimum in community facilities at the time a new area is developed. Often, the developer is required to bear the cost of such facilities as are installed, but his financial participation is kept low by specifications which allow construction of streets with a weak base and insufficient paving, water lines not large enough to furnish adequate fire protection, makeshift sewerage systems and by overlooking installation of street lights, storm drains, parks, school sites and other community needs. The burgeoning

residential suburbs found on the fringes of most major United States cities frequently succumb to this lure of low initial costs. Their very newness sometimes means that their city officials have not been through the problems of rebuilding inadequate facilities, or of providing missing facilities at a cost considerably higher than would have been necessary when the addition was first developed. The third approach for providing community facilities is one that is becoming the common pattern as the causes and effects of community growth become more clearly delineated. Under this approach, cities are establishing and enforcing standards and specifications that will provide for long-range needs. In addition, an increasing financial participation by land developers and

awareness that it is not equitable for developed areas of the city to pay for facilities benefiting only a new subdivision.

Another cause for the trend of increasing the financial participation in community facilities by new areas and their developers is that many cities have inadequate funds for facilities and other service requirements caused by development of the areas. The obligation to extend normal recurring municipal services to an expanding population, coupled with the inhibiting effects of inflation on municipal treasuries, forces the financing of a larger part of community facilities by some means other than from the revenues of the city government.

More and more cities are adopting a division of cost for community facilities based upon relative bene-

fits received by the new and the developed areas of the city. However, the land developers and home builders who, under such plans, are required to bear a greater part of the total bill can be depended upon to offer well-organized and determined resistance to these proposals.

### **The Developers' Position**

The basis for advocating that the cost of community facilities be borne by the city-at-large commonly rests on variations of the following four basic points: 1) Taxes collected by a city on new houses represent a profit to the city government, and the city is obligated to use this new revenue to pay for the community facilities needed; 2) developers are responsible for city growth and therefore they should be assisted financially in providing facilities necessary to make their home sites salable; 3) if the city government doesn't pay for community facilities—or engineering standards are too high—development will occur outside the city limits, thus eliminating the possibility of the city collecting taxes which would, at least partially, offset the financial burden resulting from persons who would otherwise be daytime residents only; and 4) revenue-producing facilities such as water mains should be paid for from revenue produced by the new customers added to the system. As with the first point, the assumption is that providing service to new customers can be done at little or no expense, except for the initial expenditures for the service extension.

While the applicability of these arguments will vary depending upon the individual circumstances of each city, they often overlook several basic factors important in the financing of city governments and in the urban growth patterns. The contention that revenues resulting from new homes are profit to the city overlooks the cost of extending basic services, such as fire, police, and health protection, necessary for a growing community. Studies of property taxation in a number of cities throughout the United States have indicated that residential taxes rarely equal the cost of providing services to residential areas. Therefore, there is usually little tax surplus or profit in new subdivisions that can be devoted to installing community facilities such as streets, storm drains, street lights, etc.

In analyzing urban growth patterns, developers and home builders in metropolitan areas often point to rapidly growing satellite commu-

nities where developer costs in community facilities are comparatively low and reason that the suburban community's existence is the result of the modest investment required of developers for community facilities. The answer, however, would appear to lie elsewhere, since a reasonable assumption would seem to be that homes are built where people wish to live, and not vice versa. The existence of satellite communities in major metropolitan areas, and their bright growth prospects, can more logically be traced to the construction of freeways, decentralization of industry, and a desire for elbow room in the suburbs. The influence on area growth patterns of the cost distribution of community facilities between developers on one hand and the city on the other would appear to be remote in most instances.

The argument that revenue-producing facilities should be paid for from revenues of the system is an appealing one because of its widespread application in financing private utility service extensions. While this approach has some application in respect to water or sewer extensions, the means of financing often used by private electric, gas, and telephone companies cannot be adopted as a tried and true procedure which will serve municipal government as well as it does private utilities. One difference is that private utility rates are often based on a fair return on the total investment in plant, making it more desirable for the utility to pay for service extensions. Another factor is that the investment per extension for such utilities as electric, gas and telephone companies is usually substantially less than for water and sewer utility extensions.

There is some justification for the city's participation in revenue-producing water and sewer lines, if the rate structure for these services allows such participation and has had the effect of causing participation by the city-at-large in such exten-

sions in the past. Development of a formula to put this concept into effect must be done on an individual basis in each city. However, detailed studies in at least two cities have established a justifiable participation by those cities of 25 percent or less of the cost of on-site sewer and water lines. Furthermore, this approach does not make allowance for the benefit new customers receive from previous investments in the existing water and sewer system, for which they paid no part.

### **Fort Worth Adopts New Policies**

Because there was some feeling that liberal city participation in community facilities would encourage growth within the city limits, and due to the difficulty of overcoming developers' objections to financing of community facilities in new additions, for many years Fort Worth participated generously in the financing of community facilities in new additions. However, its rapid residential growth—as indicated by a doubling in population and an area increase of more than 150 percent since 1940—pushed Fort Worth into the same plight as numerous other cities. It was faced with an increasingly severe financial condition which would have required higher taxes and/or water and sewer rates had Fort Worth elected to continue financing the same proportion of the cost of facilities serving new subdivisions that it had carried in the past. Also, residents of already built-up areas were becoming increasingly aware that they were paying for facilities primarily benefiting newly developed areas, and there was strong feeling that they should be given some relief from this burden.

A practical solution justifiable both to already-developed and newly-developed areas was called for. A thorough study of the problem and its causes, and the manner in which it was handled by other cities, indicated that there was an equitable and reasonable formula

**Table 1—Cost Per Lot of Community Facilities Based On A Hypothetical Subdivision, Fort Worth, Texas**

Facility	Cost Under Old Policies	Percent Paid By City	Cost Under New Policies	Percent Paid By City
Streets	\$ 585.70	31	\$ 684.76	25
Storm Drains	150.26	49	166.22	7
Sanitary Sewers	332.64	54	332.64	35
Street Lighting	30.11	100	136.40	12
Water Mains	324.36	59	324.36	44
	\$1,423.07	46	\$1,644.38	28



● **WATER MAIN** installation policies require developers to pay 75 percent of cost of water mains, with city paying 25 percent plus cost of needed oversize facilities.

for distributing the costs of community facilities needed in new subdivisions. This formula called for new additions to bear the cost of facilities directly serving such additions, with the city-at-large paying for oversize costs which benefit, and are of service to, areas larger than the immediate addition.

In adopting its new policies for installation of community facilities, the city council also recognized and provided for the solution to another problem common to many cities—that of building facilities engineered to meet the present and future usage demands of the community. The policies provide that the City of Fort Worth shall have responsibility for engineering, inspection, and letting of contracts. The only exception is in street construction where contracts are let by builders, but according to design standards of the city and under careful supervision of city inspectors. Further, the policies provide that where doubt exists as to need for a given size or type facility, such doubt is to be resolved in favor of the better quality installation, since experience has shown the tendency to underestimate future needs.

The plan for distribution of costs on the basis of benefit and application of adequate engineering standards, is applied to the construction of streets, sanitary sewers,

water mains, storm drains and street lights in the new additions of Fort Worth. Adoption by the city council of the new policies based on this formula places Fort Worth in a sound position to handle the substantial growth anticipated in the next decade in a manner beneficial to all citizens of the city. In the policies adopted, the few deviations from this general approach are the result of local conditions and, in the case of water and sewer lines, the ability and equity under the present rate structure, of the city to absorb a percentage of the cost of smaller mains benefiting specific additions.

For streets, the new policies provide that developers shall bear all costs up to a width of 40 ft., with the city bearing the extra cost of wider streets and of additional construction if the city requires a pavement suitable for arterials and major thoroughfares rather than the usual residential paving. Where a street divides properties controlled by separate owners, construction costs are assessed equally to each party.

A closed storm drain system is required where storm water runoff can be carried in pipe 34 inches in diameter or less. Storm drainage needs of the entire drainage area are considered. When necessary the developer is required to furnish an engineering study of the drainage

area. The developer pays for all costs of storm drains up to 36 ins. in diameter, with the city paying for 25 percent of the difference in cost of furnishing and installing pipe between 36 ins. and 84 ins. The cost of all excavation, manholes, inlets, leadwalls, etc., are borne by the developer. Where an 84-in. line is not adequate to handle storm water runoff, concrete lined drainage channels are permitted, and the city pays for 25 percent of the cost of the channel lining. In summary, it is estimated that the overall city participation in the necessary future storm drain needed to serve the city will be approximately 10 to 15 percent of the total cost.

As the value of an adequate street lighting system is becoming better recognized, more and more cities are requiring some developer participation in street lights. In cities where the lighting system is owned by a private electric utility, installations are usually made by the utility with the cost being included in the basic electricity charge. These cities which have a privately owned lighting system and require developer participation, most often collect a lump sum payment from developers to offset future operating and capital costs. In Fort Worth, the street lighting system is owned and maintained by the city, with electricity being purchased from a private utility. Prior to adoption of the new policies, all street light installations were made at city expense and only intersection and mid-block lighting was normally installed in residential areas. However, in recognition of the fact that good residential street lighting benefits adjacent property by increasing its market value and is a facility frequently requested by homeowners, the new policies of Fort Worth require that developers pay the total cost of installation of residential street lighting. On arterial streets, the city pays for the street lighting installation expense in excess of normal residential lighting. The new policies require that 4000-lumen lamps be placed at approximately 200 ft. spacings. Metal poles are required in neighborhoods where the majority of houses sell for \$13,000 or more, with wooden poles optional in neighborhoods with less expensive houses.

For water and sanitary sewer extensions, the Fort Worth policies require that the developer pay 75 percent of both on-site and approach mains that are necessary to serve an addition. The city bears the re-

(Continued on page 154)



## BLUEPRINT FOR BARE ROADS...

**J. W. REPPLE**

Engineer of Maintenance,  
Ohio Department of Highways

OUR NATIONAL economy requires open transportation lanes for motor vehicles 365 days a year. The motorist expects pavements to be clear, passable and hazard free at all times and he is prone to overlook problems of snow and ice control units in accomplishing this objective. A great deal of money is expended each year by the various public agencies to give the motorist his clear road. Following is a brief outline of the methods used in Ohio during the winter months.

Governor M. V. DiSalle recognized the need to keep our highways free of ice and snow and requested Director E. S. Preston to take measures to provide bare roads on Ohio highways throughout the winter months. Director Preston established a "Blueprint for Bare Roads" directive last year which covered operational procedure. This included advance warning systems, dry runs, communications, equipment and material as well as actual application techniques. Both the Governor and the Director realized that the cost of this policy would be somewhat higher than in previous years, but it was their opinion that benefits to motorists through savings and increased safety would

more than counterbalance the increased costs.

Ohio's State Highway System totals a little over 18,000 miles. We do not maintain state highway extensions in cities and our total snow and ice maintenance approximates 17,000 miles. Deputy Director of Operations, T. Dye Barnhouse supervises the Bureau of Maintenance, Motor Transport, Traffic, Communications and Safety. We have twelve divisions, varying from three to nine counties each, with mileages averaging around 1500 per division. Each division is administered by a division engineer and snow and ice work is handled by the division maintenance engineer. Each county is directed by a superintendent, who operates from a garage usually located in the county seat, with outposts in some counties at other critical locations. We have a statewide maintenance force of approximately 4,600 men and about 1,600 pieces of equipment, which can be used on this type of work. We operate on a priority basis consisting of five systems classified principally upon traffic volume.

Dry runs are conducted the last two weeks in October each year to check snow and ice equipment. Inspection covers all phases from physical appearance through direct operational functioning. All equipment is cleaned, painted when necessary and kept in first class condition at all times. This inspection, which assures that equipment is

ready for work any time, pays off and we no longer have the problem of facing a snow storm with equipment which is below standard or down for repairs.

Ohio has a large radio net of over 2,100 two-way mobile sets, or an average of 16 to 30 units per county throughout the entire state. Permanent base stations are located in every county and all snow and ice equipment is equipped with radio. We consider radio equipment a must in our snow and ice work, as well as in many other operations, and believe it is the most valuable tool which we have acquired in recent years to assist in maintenance work. We have a rather elaborate

● **PLOWING BACK** the shoulders keeps the pavement free from drifting snow, assures run-off to speed drying.

reporting system and radio plays an important part in this as well as in direct operational use.

Our winter reporting starts December 1st and ends March 31st. We extended the reporting date to the 15th of April this year to be sure the snow season was covered. Counties report to division offices by radio twice a day. The division consolidates information from counties within their division and submits it to our central office by teletype each day at 7:30 AM and 1:00 PM. Our Division of Operations Communications Bureau summarizes this information and compiles a statewide report for distribution over the State and for broadcasting by the Highway Patrol. These reports are sent out to various agencies such as automobile clubs, radio and TV stations, etc., as required. During emergency periods or unusual local conditions, extra reporting periods are put into effect at 3:30 PM and 9:30 PM. This procedure presents an up to date picture of statewide road conditions and permits our central office to assist the divisions where needed.

Ohio rented weather service at one time from a private forecasting firm but for the last two years we have arranged to receive U.S. Weather Bureau information by teletype installed in our central office Communications Bureau. Forecasts are teletyped to all divisions four times a day and oftener as needed. Our maintenance forces



● **CHEMICALS** are used quite universally in most districts of the state to keep pavements bare. Covered storage is provided and non-caking additives are used.

require reliable advance storm warnings to assure uninterrupted winter traffic movement. Estimated time of snow or sleet with probable storm duration, snow depths, wind velocity, etc., are well worth the cost. In connection with weather reporting, our statewide radio net affords an excellent opportunity to follow a storm across the state and assures our being ready when the storm hits any given area.

We occasionally find it necessary to rent equipment to supplement our own plows and each division maintenance engineer prepares and maintains a list of contractor's equipment which will be available for emergency use. We have given the divisions permission to rent this equipment at their discretion to open up blocks and we have at various times saved the motorist a great deal of time by this method of operation. We also maintain reserve lists of personnel to supplement our regular work forces. It is difficult normally to obtain people willing to work under these circumstances, but again we have overcome emergency situations through the use of outside personnel.

Most of our divisions use clear chemicals to keep pavements bare and we prefer covered storage for sodium-calcium chlorides. We use a considerable quantity of sodium chloride and believe that we can achieve quicker and more efficient loading from covered storage. Most of our salt is treated with a non-caking additive but we still feel that under-cover stock piles are most desirable.

### Road Operations

We have discussed up to this time general principles pertaining to our overall operation and I will now try to cover briefly our actual road operations. Ohioans can all remember the "snow bowl" episode in November, 1950, when several thousand motorists spent uncomfortable hours bucking snowdrifts on the way home from the Ohio State-Michigan football game. We've had bad storms since then, but for sheer, unadulterated, continuous, "winter orneriness," the four-week period from February 13 to March 12 of last winter, ranks with the best of them. Geauga and Ashtabula Counties in Northeastern Ohio, can have their 8 or 10-inch snows with the greatest of ease, but when Portsmouth on the Kentucky border, has two 10 inches in five days—that's news—and trouble! We keep a record of snow depths by divisions throughout the State, and we had an average of 68½ inches for the five month period from November through March; this compares to 46½ inches for the same period of the previous winter.

Different types of storms require different ways of treatment. We normally try to spread sodium chloride at the beginning of a storm, and this material, close to the pavement under the snow, tends to make the snow mealy and assists in obtaining a bare pavement after plowing operations cease. Snow plows should operate as soon as there is enough accumulation to justify keeping the road clean. If

temperatures are low and the snow is not packing, plows should be used and followed up with light applications of chemicals if surface conditions still remain hazardous. Chemically treated grits, abrasives, or cinders are recommended to de-slick or remove glare ice when the temperatures are below 10°F. We are experimenting with combinations of calcium and sodium chlorides in our five northern divisions to ascertain if applications of this type are more effective than straight salt. We know the eutectic points of sodium chloride and calcium chloride are -6°F and -67°F, respectively, which means that combinations with calcium chloride particles to start melting action and trigger the salt component, will achieve better results in the lower temperature range. Several states have expressed satisfaction with combinations, and we hope to know by next year whether this will be satisfactory for our use.

One of the secrets of a good winter operation is to keep patrols out to report hazardous conditions as they occur. Pickups or trucks should be loaded with chlorides or abrasives and be ready to take care of local hazardous conditions prior to a county-wide operation. Plows should be kept on the trucks at all times so that they will be ready to work without delay. Weather reports indicating possible bad weather require loading of trucks with proper materials ahead of time to minimize delays when needed.

Oftentimes bridges will freeze up and get slick while the adjacent road remains normal. This type of hazard can be detected only through the use of adequate patrols equipped to take care of existing conditions as required. We have many complaints from property owners about blocked drives, but it is impossible for us to prevent this type of initial inconvenience to the property owner. We usually try to take care of intersections during our cleanup operation—which consists of plowing back berms, cleaning bridges, removing snow from superelevated curves, etc. This operation provides storage for subsequent snowfall and also eliminates possibility of snow melting and freezing on the pavement at night. One frozen spot on an otherwise normal surface is potentially more dangerous than an entire snow-covered highway and we try to control these places as best we can. Snow fences are placed on highways subject to drifting. These



● AFTER the initial plowing, widening follows. Here two large plows, operating in tandem, are clearing a country road.

fences are normally placed on north and south roads about 100 feet from the edge of the pavement and prevent a lot of snow covered pavements. We also provide storage drums on hills and curves filled with chloride-treated abrasives for use by motorists if slick conditions arise before our trucks can get on the job.

Several sections of the Interstate System are now open to traffic in different parts of the State. Ohio will have about 1,450 miles of the completed system and we are endeavoring to get set up to give these important highways top priority maintenance. We are acquiring sites for maintenance outposts about every 20 miles. We are going to integrate this system with our present state highway setup and are providing equipment and personnel at these outposts to work under the supervision of our county superintendents. We are constructing concrete block buildings to house our trucks and are also building chemical storage facilities and pole type structures to house various types of equipment.

I endeavored to evaluate losses which could be attributed to blocked or slick, unsafe highways and found it impossible to come up with any tangible figure. Last Feb-

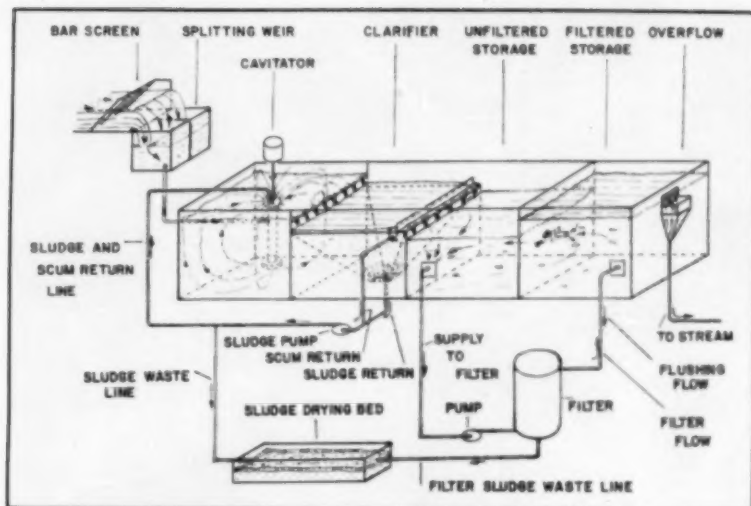
ruary's snow storms in some southern states blocked roads and necessitated supply drops by helicopter. Isolated communities, without milk, bread and other perishables—often times inaccessible to the medical profession—can rapidly become catastrophe areas. Direct losses to manufacturing companies and wholesale and retail businesses, combined with those incurred by cartage and transportation agencies—as well as immeasurable hardships suffered by entire urban and rural communities—can add up to a stag-

gering dollar total. Ohio had about four and a quarter million vehicles registered in 1959 and it is imperative that our highways be kept open and passable for their uninterrupted use to assure the orderly continuation of the state's everyday business. The highway user pays his taxes for this purpose and we can be sure that our snow and ice expenditures are justifiable as well as necessary.

*This a slight condensation of a paper presented by Mr. Reppel at the 14th Annual Ohio Highway Engineering Conference, Columbus, Ohio.*



● THOUGH plowing starts early, some portions of some roads drift badly. Plowing and widening in such heavy snow as this is a job for a wing-equipped crawler tractor.



5 mg/L grease. The California Water Pollution Control Board, in establishing its standards, considers present and potential general land use of the area concerned, the proximity to dense population, the type of soil and the use of receiving waters.

On the other hand, to be annexed by the city would mean picking up the city tax rate for an additional annual tax bill of \$18,000.

The author was retained by the company to work out a solution to its problems. It was recognized that in addition to the requirement of an unusually high degree of treatment,

● UNITS were assembled in the shell of an old septic tank, allowing ample capacity for recirculation of effluent.

## AEROBIC DIGESTION + DIATOMITE FILTER

This formula was tried by a California industry to provide domestic waste treatment at its plant and a colony of 15 employee homes, as a result of public health restrictions on effluent quality. A continuous body feed filter, automatically washed, gives the polishing touch after oxidation.

**HARRY SHATTO**  
Consulting Engineer,  
Western Engineers,  
Berkeley, Calif.

TO PROVIDE sewage treatment for 65 to 70 people with a plant that would meet unusually high effluent standards and require minimal daily attention, was the problem facing the Coast Manufacturing and Supply Co. near Livermore, Calif. The design solution resulted in a unique combination of equipment, an aerobic digestion plant followed by a diatomaceous earth filter for effluent polishing. The plant was installed a year ago to handle the sewage from 15 residences, offices and plant at the company's manufacturing site, replacing a septic tank which had ceased to operate effectively.

The company, which manufactures fuses for the mining industry and coated fiberglass materials, established its plant in 1913, on an isolated 300-acre site in the Livermore Valley and dispersed its plant facilities to minimize capital loss in the event of an explosion. Here, at

this remote location, the company also provided homes for its owners and managerial personnel.

As the years passed, the character of the area and the nature of the company's business changed. The city of Livermore grew. Pinched for space and feeling a need for the added revenue that would come from industry, the city annexed some 500 acres of choice property adjacent to the railroad including a linking strip which ran through the heart of the Coast Manufacturing and Supply Company land. It was this situation that focused attention on the inefficient septic tank.

The company was given the alternatives of having all of its property annexed to the City and connecting to the Livermore sewerage system or providing its own treatment plant—a plant that would meet the rigid standards of the California Water Pollution Control Board and the Alameda County Health Department. These standards required that the domestic sewage, which runs about 200 mg/L BOD and 400 mg/L suspended solids, be reduced to an effluent with less than 10 mg/L BOD, 10 mg/L suspended solids and

the plant must be as automatic as possible; be suitable for operation by maintenance personnel of the Company; and occupy about the same amount of space as the septic tank structure it was replacing.

### Plant Design

A Yeomans Cavitator aerobic digestion system was employed as the basic treatment device. Mechanical aeration is provided by the Cavitator by means of a multi-blade rotor connected to the submerged end of a hollow shaft which is mounted inside a draft tube.

As the rotor revolves, air is drawn down the hollow shaft and is discharged into the liquid through the cavitation effect produced; the liquid level rises, flows over the lip of the draft tube cone, and a pumping action takes place, effecting complete circulation and mixing.

Although it had never been used in full-scale sewage treatment, a new automatic diatomite water filter developed by DeLaval Turbine Pacific Co. appeared to be adaptable for polishing the effluent. This decision was reached jointly by Charles Becker and Warren Snow of De-

Laval and the author, based on previous pilot plant experiments.

The filter has many automatic features. It is precoated, with recirculation continuing within the filter until the precoating is complete. As a safety factor, the filter will not go on the line until this occurs. During operation, diatomaceous earth is fed continuously at a controlled rate into the secondary treatment effluent during the filter run. This small amount of body feed mixes with the effluent and forms a porous cake on top of the precoat.

As the filtering continues, the cake thickness increases and, as a result, so does the pressure differential between the inlet and discharge line. At the end of the run a pressure actuated control starts the cleaning cycle, and a double air bump cleans the filter tubes. Following the rinse and drain cycle, the precoating, filling and recirculation operations put the filter back on the line automatically. Total downtime for cleaning and precoating is approximately 15 minutes. Heart of the filtering system is the patented DeLaval self-flushing eductor type slurry feeder which has no check valves or pumps to clog. The uniform precoat application and an easily regulated body feeder reduce operating costs by controlling the amount of diatomaceous earth used.

To convert the existing septic tank structure, which was above ground, the outside walls were raised 26 inches and the tank was divided into six compartments—four of them for immediate use and two for future expansion.

With the four compartments arranged in series, the Cavitator was installed in the first; the second became a clarifier; the third, a storage tank for the filter influent; and the fourth, a storage tank for the filter effluent.

A hopper-type bottom was poured in the clarifier compartment to bring the sludge to a centrally-located pump connection, and an inlet trash rack and weir were constructed to provide rough screening and control of incoming sewage so that eventually it could be split between two Cavitators. A sludge drying bed was added, having dimensions of 6 ft. by 16 ft. It is equipped with tile underdrains and filled with sand and aggregate to a depth of one foot. A small building was erected along side the tanks to provide shelter for the filter plant.

The Cavitator tank, settling tank, filter inlet tank and filter discharge tank are 8 ft. by 8 ft. by 6.6 ft., each with a capacity of 3200 gallons.

The treatment plant was expected to handle 5000 gpd, but the capacity of the tanks provides an 18-hour holding capacity in the aeration tank instead of the 24 hours recommended. This reduction in detention time apparently has had no adverse effect on the operating results.

### Operation

In operation raw sewage is pumped and flows into the Cavitator tank where it is mechanically aerated, with overflow into a settling tank. Settled sludge is returned to the draft tube in the aeration unit. The sludge pump operates five minutes in every 20.

The effluent from the settling tank passes over a weir to the filter influent storage tank, through the diatomaceous earth filter into the discharge tank. The filter effluent is recirculated to provide a constant flow of clear water to the filter during periods of fluctuation in the volume of influent and to keep it in constant operation. A check valve between the filtered and unfiltered effluent storage tanks prevents short circulating during filter backwash.

The present flow is about 7,500 gpd, but the influent pump operates at 150 gpm, making the inflow very intermittent. The flow through the filter is 40 gpm; with 25 sq. ft. of filter area, the filtration rate is 1.6 gal. per sq. ft. per min. The diatomaceous earth used is Johns-Manville HyFlo, applied at the rate of 8 lbs. per day; including 5.5 lbs. per day body feed and 2.5 lbs. per day fed as a precoat.

The plant requires manual attention to the extent of 15 minutes twice per day for inspection and refilling of the slurry tank plus a short time once per week for cleaning the bar screen and burial of screenings. The used diatomaceous earth and waste sludge are discharged to the sludge drying beds which are cleaned at three month intervals. The bed drains to the receiving stream.

The tests made on the final effluent have shown no detectable BOD and only a trace of suspended solids and grease. These results were not attained, however, without some modifications of the original operating technique.

During the early phases of the operation, algae grew in the holding tank, through the lines into the filter and on into the clear water tank. A complete tear down of the filter unit was necessary to remove this troublesome growth. Covering the filter inlet and discharge tanks kept

out the sunlight and solved the problem.

Another problem that plagued the operation was the formation of slime on the filter tubes which progressively shortened the filtering cycle of the plant and required the frequent removal and cleaning of the tubes. By adding controlled amounts of chlorine to the body feed the slime problem was overcome and today the Cavitator-filter unit is operating without difficulty.

### Cost Analysis

The principal costs, aside from labor, are for diatomite and power, and for the Livermore plant these are 24 cents and 30 cents per day, respectively.

In projecting these costs to larger scale operation, consideration must be given to the economies that would result from employing the units to full advantage, not possible with the small plant designed for Coast Manufacturing Co. The 150 gpm influent pump had the effect of "slugging" the settling tank, upsetting the effectiveness of settling and requiring a higher rate of diatomite body feed. The filter was the smallest standard model made by De Laval, yet in the Livermore plant, its capacity was many times that needed. Because of the newness of the plant, the personnel at Livermore are backwashing the filter daily although the pressure drop is such that runs could be considerably longer and the precoat cost proportionately less. In a larger installation, it is estimated that a 60 mg/L body feed could be used compared with 90 mg/L at Livermore, and a 48-hr. filter run without recirculation is feasible. Under these conditions the diatomite cost would amount to \$15.30 per MG, or \$19.60 per MG including power requirements of the recirculating pump.

The equipment and construction costs of the Livermore plant, including renovation of the septic tank, amounted to \$25,000. Ninety percent of the equipment can be relocated if necessary and the plant can be expanded to 10,000 gpd capacity with an additional expenditure of \$3,000.

It is felt that this equipment adaptation is a significant advance in sewage treatment in that it reduces the entire process to a mechanical one and eliminates to a great extent the sludge disposal problem. Because the diatomite filter will remove micron-size particles regardless of their density, the settling period is not as critical as in the standard plant.

# MUNICIPALITY TESTS

## Two Slurry Seal Methods



● UNIFORMITY of spread pattern and coating thickness is clearly evident in this view of the asphalt slurry seal coat.

THE increasing popularity of using a slurry seal treatment for preserving bituminous concrete surfaces prompted the Borough of Princeton, N. J., to investigate application methods for heavily traveled Borough streets. With the co-operation of the State Highway Department and utilizing State aid maintenance funds, a test procedure was devised, with all of the work to be done by contract except cleaning the surface. The initial application was scheduled for October, 1959, but unusually cold, humid and wet weather made impossible proper curing and evaluation of the coating. The second test was made during the week of September 19, 1960, and it involved parallel treatments with an emulsified asphalt sealcoat and with a coal tar pitch emulsion coating. In each case approximately 7,500 sq. yds. of pavement surface was treated.

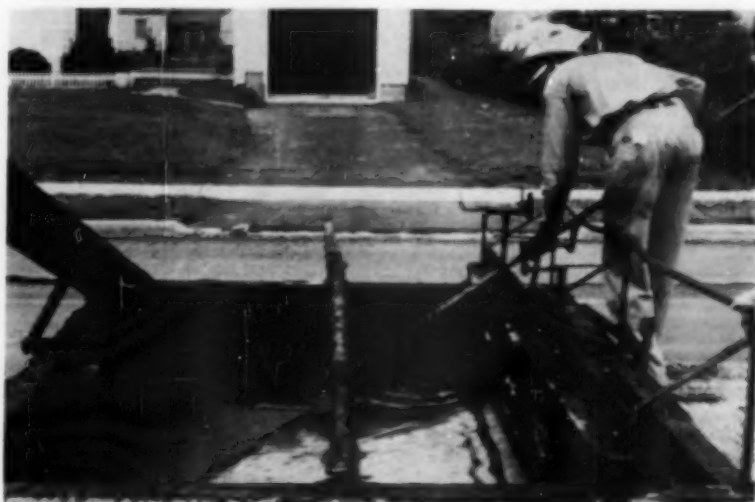
Experience with the use of water emulsions for pavement coating has shown that the emulsions are sensitive to weather conditions. The controlling atmospheric factor in obtaining an acceptable coating is moisture. High humidity hinders evaporation of the water component. Rain falling during or immediately after application tends to maintain the bituminous components in an emulsified state so that they drain off with storm water or become displaced on the pavement surface. Rain occurred the first part of the week selected for the 1960 test, but

by the following Wednesday weather conditions were considered suitable for application of the tar slurry. It remained dry the rest of the week with temperatures well above the 50°F minimum, resulting in ideal conditions for completing the tests. By Friday afternoon, the asphalt coated surface treated on Thursday was firm and uniform with almost the appearance of a new pavement. The coal tar pitch surface which had been applied at mid-morning on Wednesday, was still slightly tacky, but there was evidence of adequate

penetration of cracks and coating of exposed aggregate.

### Asphalt Slurry

The asphalt slurry was prepared from emulsified asphalt type SS-1, sold by American Bitumuls and Asphalt Co., and sand and crushed stone aggregate of the gradation shown in Table 1. The emulsion and aggregate were combined in a transit mix truck with enough water to provide a fluid consistency without causing segregation. The proportion of the asphalt emulsion to the ag-



● THE SPREADER BOX, towed by a ready-mix truck, is charged with asphalt slurry by a chute from the mixing drum. The workman keeps a uniform supply of material distributed across the 10-ft. wide face of the neoprene squeegee for even coating.

gregate was 50 to 60 gals. per ton.

The pavement surface, about 8 years old, was cleaned by Borough forces, and the contractor completed the operation, applying a tack coat of emulsified asphalt diluted with three parts water. This tack coat was uniformly distributed by means of a spray bar equipped with cone nozzles delivering the material under a pressure of 125 psi. The rate of application was specified as 0.05 gal. per sq. yd.



● APPLICATION of the coal tar pitch emulsion slurry is made from the specially designed distributor equipped with an agitator to keep the fine sand in suspension.

Following the tack coat, the slurry seal was applied. The transit mix truck towed a spreader box, 10 feet wide by 8 feet long, equipped with neoprene squeegees. The box was sectionalized for width adjustment and the squeegees were capable of vertical adjustment. A spray bar was attached to the transit mixer to disperse a water mist ahead of the movement of the spreader box when conditions warranted. The equipment was designed to lay a  $\frac{1}{8}$ -in. coat of the slurry seal. By these means the volume of materials applied was controlled at 0.2 gal. per sq. yd. of the asphalt emulsion with 5 to 7 pounds per sq. yd. of aggregate. No surface protection was employed during curing, except to keep traffic off the pavement over night.

#### Coal-Tar Pitch Emulsion

The selection of materials used and application methods for the coal-tar pitch emulsion seal coat was derived from Federal Specifications R-P-00355, Coating Material for Bituminous Pavements, and SS-R-406, Road and Paving Materials: Methods of Sampling and Testing; and from ASTM designations D 1010-58, Methods of Testing Bituminous Emulsions for Use as

Protective Coating for Metal; D 466-42, Methods of Testing Films Deposited from Bituminous Emulsions; D 244-55, Methods for Testing Emulsified Asphalts; and D 633-44, Standard Volume Correction Table for Tar and Coal Tar Pitch.

The Borough specified that the emulsion pass the tests which would demonstrate resistance to heat and cold; satisfactory drying time and flexibility; resistance to motor oil, gasoline and distilled water; and

pumped through a 12-ft. spray bar equipped with cone nozzles, under a pressure of 125 psi.

The procedure in general consisted of cleaning the surface to be treated, dampening it with a distributor truck and then applying two coats with a minimum coverage of 0.1 gallon per sq. yd. per application. This method is also weather-sensitive, requiring temperatures between 45 to 60°F and no precipitation within 24 hours. Curing time is four hours and the treated area must be closed to traffic during this period.

#### Evaluation

The spray application method (tar slurry) resulted in a uniform coat appearing to penetrate voids and cracks. It, of course, did not fill in the depressions and irregularities in the original surface, as occurred in the test with asphalt slurry seal. The pavement surface treated with coal tar pitch is 10 years old.

The processes are being evaluated by comparing the resulting surfaces with conventional stone or chip seal applications made on similar streets immediately after the slurry seal project. Automatic traffic counters have been installed to indicate traffic volumes on the various treated streets. The extent of wear will be determined visually and recorded photographically. The observations will be reported next year and periodically during the future years of the life of the surfaces.

A summary of experiences to date are as follows: 1) In general both slurry treatments eliminate dust, noise and excess stone problems; 2) the tar slurry formulations should contain enough sand to prevent the material from bleeding and becoming slippery; 3) the tar slurry application was the easier and more rapid of the two methods.

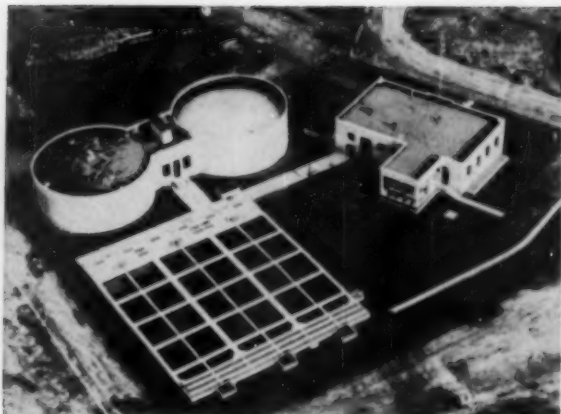
The cost of the treatment amounted to \$0.28 per sq. yd. for the coal tar pitch emulsion and \$0.32 for the asphalt emulsion. This may appear high in comparison with the experiences of other municipalities, but is not excessive when the relatively small area involved is considered. Also this cost is for complete treatment. Many times municipalities ignore labor and other hidden costs when all of the work is performed with municipal forces. The equipment used was designed and built by the contractor, the Copeland Co., Inc. The work was done under the supervision of the Borough Engineer, Arthur T. Brokaw.

Table 1—Gradation of Aggregate for Asphalt Slurry Seal

Sieve Size	Percentage Passing
4	100
8	95-100
16	70-95
30	50-70
50	30-50
100	10-25
200	3-10

Table 2—Gradation of Sand for Coal Tar Pitch Emulsion

Sieve Size	Percentage Passing
No. 16	100
No. 20	50-80
No. 40	30-60
No. 100	0-5



● TWO OF THE treatment plants considered in this article. Both are located in Connecticut and serve about 40,000 population. At left, the Stratford plant provides primary treatment only. Fairfield plant, right, is of the activated sludge type.

## Equipment Requirements For Modern Sewage Treatment Plants

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Bowe, Albertson & Associates,  
Engineers,  
New York, New York

**M**ECHANIZATION of sewage treatment plants in this country is a modern trend that for obvious reasons is here to stay. Although associated with many added maintenance responsibilities when compared with the old days of the septic and Imhoff tank, superior results of treatment, added flexibility and reduction in manual work make more highly mechanized plants a nearly unanimous choice.

The tabulation of mechanical equipment in a medium-sized sewage treatment plant makes an impressive listing. Even the operator is often surprised. As typical illustrations, the mechanical equipment at three Connecticut plants has been tabulated herewith. The three plants are designed for dry weather flows of from 3.5 to 4.8 mgd, though a different degree or type of treatment is provided by each. It is believed that without raw sewage pumping, a plant for any particular type of sewage treatment in the capacity range from 1 to 4 mgd would have roughly the same number of

pumps, motors, etc., but of different capacities. The smaller plants would have fewer valves.

### Miscellaneous Equipment

Items of major equipment as listed in the accompanying tables are generally specified by the designing engineers. However, to equip the plant for normal maintenance and housekeeping chores and for the comfort and convenience of the operator, a wide variety of auxiliary furnishings, tools and supplies must be provided. Listed below are the furniture and supplementary equipment tabulated at the Fairfield, Connecticut, plant during a recent inventory. The Fairfield plant is of the activated sludge type and has an average dry weather flow of 4.0 mgd.

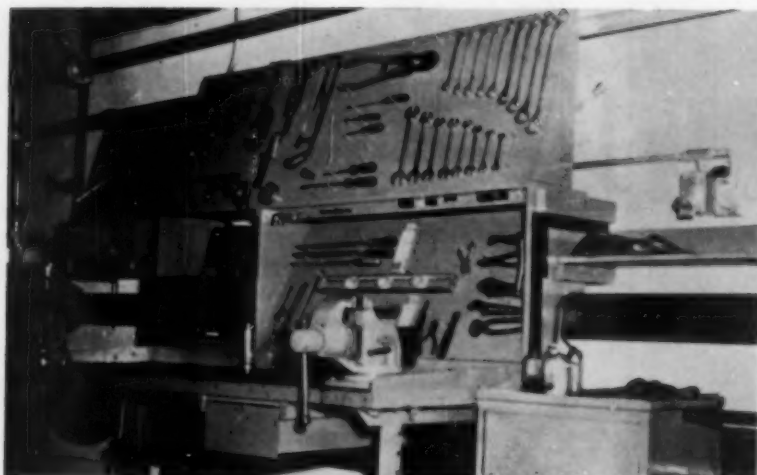
General furniture for office and laboratory are needed for any sewage treatment facility. The Fairfield plant has 2 office desks, 12 straight back chairs, a swivel chair and a side arm chair, 5 metal tables with drawers, 3 four-drawer filing cabinets, a typewriter and an adding machine. In addition there is an electric refrigerator, 9 wardrobe lockers, a storage locker and 2 spare parts lockers, 2 water coolers, 2 laboratory stools, 3 file card cabinets, a clothes tree and 6 wastebaskets.

At Fairfield the operating personnel handle most repair and maintenance jobs. For plant operation and exterior maintenance they are provided with 2 grit buggies, 2 hose reels and 2 wheelbarrows, a lime spreader, lawn roller, 3 brush scythes, 3 lawn rakes, 6 shovels, 3 picks, 2 snow shovels and 450 feet of  $\frac{3}{4}$  to  $1\frac{1}{2}$ -in. rubber hose. For maintenance of specific plant units the supplies include 770 Saran diffuser tubes, one filter drum winding mechanism, 3 chlorine injectors, 1000 wearing shoes for tank flights, 250 redwood flights, cast iron sprockets and miscellaneous pipe fittings, unions, elbows, tees, couplings, bushings, reducers, valves and electrical parts.

The tool rack has one set each of open wrenches, socket wrenches, Allen wrenches, stud and bolt taps, pipe dies, knock-out punches and screw extractors. There is a soldering iron, a bolt cutter, an impact driver set, a 100-ft. steel tape and two 6-ft. rules, a hack saw, 2 pipe cutters and 3 steel files. Power equipment includes a portable electric saw, 2 electric hand drills, a drill press, a grinder and an industrial vacuum cleaner. The hand tool assortment is completed with 5 pipe wrenches, 4 open adjustable wrenches, 4 steel chisels, 3 pinch bars, 3 vises, 2 wood chisels, a wood

# Table 1—SEWAGE TREATMENT PLANT EQUIPMENT INVENTORIES

	Stratford, Conn.	Fairfield, Conn.	Rockville, Conn.
Type of Treatment	Primary	Secondary (activated sludge)	Secondary (high rate trickling filters)
Population Served	40,000	40,000	17,300
Average Dry Weather Flow	4.8 mgd	4.0 mgd	3.5 mgd, of which 1.52 mgd is industrial waste
Treatment Units	Mechanical grit chamber; 2 comminutors; raw sewage pumping; 3 primary settling tanks; pre-chlorination; 2 sludge digesters; 2 sludge elutriation tanks; 2 vacuum filters.	Mechanical grit chamber; 2 comminutors; raw sewage pumping; 2 primary settling tanks; 4 aeration tanks; 2 secondary settling tanks; pre- and post-chlorination; 2 sludge digesters; 2 sludge elutriation tanks; 2 vacuum filters.	Aerated grit chamber; barminutor; 2 primary settling tanks; 2 high-rate trickling filters; 2 secondary settling tanks; pre- and post-chlorination; 2 high-rate sludge digesters; raw sludge concentration tank; 2 elutriation tanks; vacuum filter.
Valves (sizes under 1½" not included)	Total 127, varying in size from 1½-in. to 30-in. See Table 2.	Total 279, varying in size from 1½-in. to 48-in. See Table 2.	Total 142, varying in size from 1½-in. to 36-in.
Electric Motors	Total 53, varying in size from 1/50 hp to 40 hp. See Table 3.	Total 52, varying in size from ¼ hp to 75 hp	Total 38, varying in size from ½ hp to 10 hp
Pumps	Total 18, varying in size from 1½-in. to 8-in.	Total 24, varying in size from 2-in. to 24-in.	Total 27
Driving Units (Reduction Gears, Collectors, Conveyors)	Total 21	Total 34	Total 17
Recorders	Total 10	Total 13	Total 5
Electric Control Panels	5	4	5
Air Compressors and Blowers	4	7	2
Miscellaneous Major Items	2 screenings cutters; gas scrubber; 75 kw emergency Diesel generator with 160 hp engine; heat exchanger; oil or sludge gas fired boiler; complete gas collection system; 2 vacuum filters; sludge cake loader; 2 chlorinators.	2 dual-fuel engines, 50 and 75 hp; gas-engine driven emergency generator; 2 vacuum filters and appurtenances; sludge cake conveyor; complete gas collection system; oil and gas fired heat exchanger; 2 heat recoverers; 3 chain hoists and trolleys; swing diffuser hoist; hot water heater; 1000-gal water tank; 2 chlorinators; 8 relays for alarm system; 37 miscellaneous thermometers; 83 miscellaneous gauges.	Barminutor; 2 chlorinators; vacuum filter; boiler; heat exchanger; complete gas system.



● HOUSEKEEPING at a treatment plant takes more than a broom and a dustpan.

plane, 3 wood saws, 4 screw drivers, 3 hammers and 4 pairs of pliers. In addition there are a hand truck, 3 storage batteries and a battery charger, 3 step ladders, 2 ladder jacks, 3 tarpaulins and 2 drop lights with extension cords.

For safety there are 7 fire extinguishers and 3 canisters masks.

**Table 2—Valves at Sewage Treatment Plants**

Type and Size	Stratford	Fairfield*
<b>PLUG</b>		
1½"	8	8
2"	15	12
3"	5	11
4"	3	4
5"	—	2
6"	31	34
8"	18	21
10"	—	2
<b>GATE</b>		
1½"	2	3
2"	4	44
3"	2	32
4"	—	13
6"	—	3
8"	—	9
10"	—	4
12"	13	7
14"	—	2
<b>CHECK</b>		
1½"	2	—
2"	1	2
3"	1	16
10"	—	3
12"	4	2
14"	—	1
Slide Gates, Sluice Gates, Tide Gates	17	26
Misc.	—	18

\* If all valves down to ¼" were included the inventory for the Fairfield plant would exceed 600.

There are numerous gauges for air, gas, water, vacuum and chlorine metering or measurement, 8 manometers, a tachometer, and a testing wattmeter and voltmeter. Provided at the plant but not included in any of the above tabulations are complete laboratory apparatus and chemicals.

#### Pump Station Equipment

Though not as extensive as the variety of equipment at the main treatment plant, the items installed and in use at a new sewage booster pumping station in Fairfield are none the less impressive. This station has five motors ranging in size from 1/5 to 5 hp, a gas engine with angle gear drive and automatic clutch, two 400 gpm sewage pumps, a water pump and a sump pump, a battery and battery charger, a gas heater and blower and an 8-in. suction fan. For automatic operation there is a water level controller, an automatic relay and starter, a mercury manometer and a flow indica-

**Table 3—Electric Motors of Stratford, Conn., Plant**

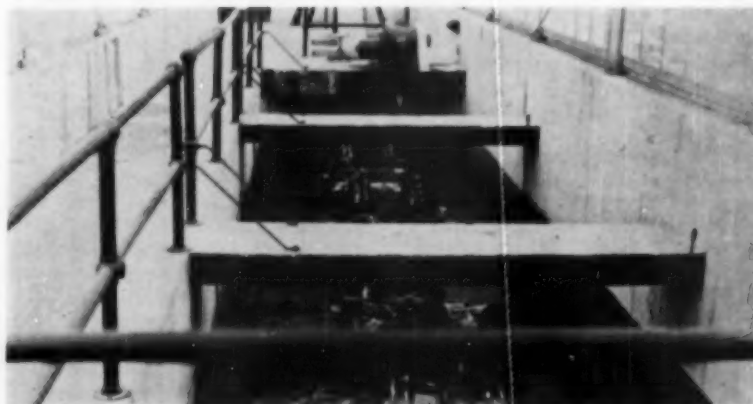
Size, hp	Number
1/50	1
1/30	4
1/12	3
1/3	2
1/6	1
1/5	1
1/4	3
1/2	1
3/4	12
1	1
1½	6
2	7
3	4
7½	1
10	1
15	2
40	3

tor and transmitter. Also provided are a 40-gal. pressure water tank, a 20-gal. tank, a metal storage cabinet and a first aid kit.

#### Maintenance is Vital

The inventories listed and tabulated here highlight the extent of mechanization of modern sewage treatment plants. Mechanical plants give operating flexibility and accurate control of sewage processing with a saving of manpower, but they also require intelligent maintenance. Good maintenance prevents frequent shut-downs, reduces plant operating costs, prolongs the useful life of equipment and fosters good public relations. A secondary benefit is improved morale among the plant employees.

Unless mechanized plants are competently operated and maintained, the large expenditures of funds for their construction will be wasted funds. It is the responsibility of supervising officials to see that means are provided for adequate maintenance of plant equipment, buildings and grounds.



● MECHANICALLY cleaned grit chamber accounts for one of many electric motors.

# FACTORS TO BE CONSIDERED WHEN INSTALLING EMERGENCY GENERATORS

**LEONARD FREEMAN**

*Sales Engineer,*

*Onan Eastern Corporation*

**B**ECAUSE of the complexity of our living and our intense need of electricity, it has become increasingly important to consider the installation of standby power supplies. The National Civil Defense program has tied auxiliary power into its program in such a way that it is necessary for communities to purchase an emergency generator for its local Civil Defense program before funds will be allocated for other equipment.

The Boards of Health of many states have also required auxiliary power for sewerage systems and water systems where the loss of power could result in a health hazard, whether due to water or sewage treatment plant malfunction, failure of pumping equipment or other. The State of Pennsylvania has developed an intricate program which requires standby power in buildings where people congregate. Many other states are looking at programs of their own along this same line and some cities, such as Newark, N. J., have developed special programs.

Considering all these factors, it becomes desirable to review when and where we should install an auxiliary power supply in our own community and in public works buildings and plants.

Once the load is determined the main factors to be considered are: 1) The type of generator you should use, whether air cooled or water cooled; 2) the type of fuel, whether gasoline, diesel or gaseous; and 3) the installation of proper ventilation, exhaust system and fuel supply.

There are several points which do not come under any of these categories which need clarification beforehand.

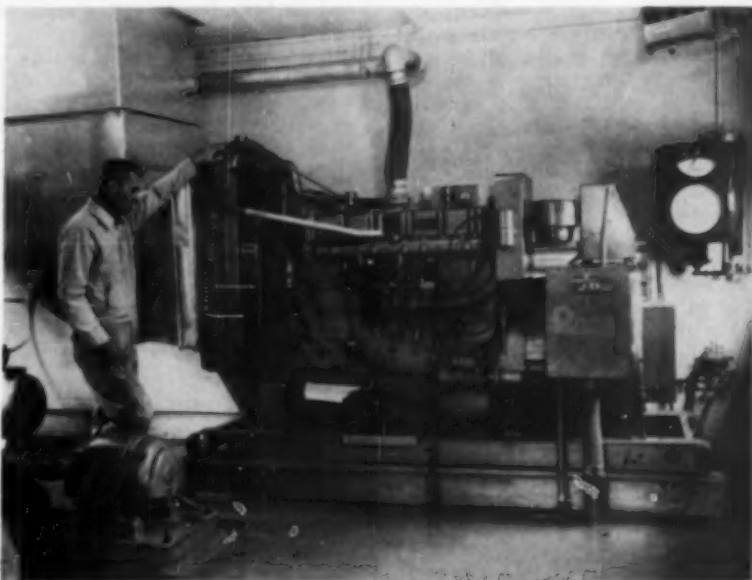
## **Get Good Engineering**

It is not intended to give the impression that a local dealer or dis-

tributor can or would substitute for the services of a consulting engineer. If your community is building a sewage disposal plant, Municipal Building, water works, etc., the consulting engineer, if he installs emergency power, covers all the factors outlined here, perhaps with

make the installation correctly in the beginning. If you are not going to do it correctly, why consider it at all?

Do not be misled by manufacturers' ratings on equipment. Unfortunately there are a few manufacturers that take undue liberties



● **STANDBY** engine and generator at a water pumping station. This gasoline powered unit is rated at 115 KW. Note engine exhaust, ductwork for ventilation and cooling.

the help of a sales engineer specializing in this field. But if, for example, you are considering installing a standby emergency generator in an existing public works building or City Hall and do not have a consulting engineer, a reliable company or dealer will supply the necessary engineering information at no cost.

When considering the installation of an emergency generator, do not have the idea that you may never use it and that careful engineering and equipment selection are not very important. When you need standby power you really need it, and the best and most reliable equipment pays off at just such times. It rarely costs more to

with their ratings. What may be labeled as a 50 KW generator may be unable to supply this load for more than a few minutes. The quickest and easiest way of checking this is to look at the horsepower rating on the engine. There should be approximately two horsepower for every kilowatt of electricity developed. For example, in a well-engineered line the 50 KW unit has a horsepower rating of 120; the 40 KW model has a horsepower rating of 90. However, if you should find a 50 KW unit that has a rating of 75 horsepower, it would be a good bet that the set will no longer develop 50 KW at some later date when the engine becomes older, because you no longer have sufficient horsepower.

This sort of problem will be avoided by dealing with a reputable manufacturer, particularly one with a well-staffed engineering department and with experience in the manufacture of the engine, the generator or both. There is much more to building a standby power set than tying an engine and a generator together.

### Cooling Systems

The first factor we will consider is the type of generator you should use—air cooled or water cooled. The load to be supplied will often be the determining factor on the use of an air or water cooled unit. By a water cooled unit, it is meant either radiator cooled or with a fresh water cooling system.

If your load is 10 kilowatts (10,000 watts) or less it is almost safe to say you can use an air cooled unit. In these smaller sizes it is possible to force air over the engine and generator at a sufficient rate to cool it properly and thus have the advantages of the lower cost and lesser maintenance of an air cooled engine. Special arrangements may be needed to remove the hot air and bring in an adequate supply of cool air for the engine. This is of prime importance in using an air cooled unit.

If the unit is over 10 kilowatts you should use a water cooled unit, because the engine becomes too large to apply aircooling principles. Different types of cooling such as radiator cooling, city water cooling and remote radiators or heat exchangers may be furnished.

### Type of Fuel

The next decision is the use of gasoline, diesel or gaseous fuel as a source of power. There are advantages and disadvantages for each type, but the thing that usually supplies the decisive answer is which of the three fuels will do the job best for the smallest initial investment and lowest operational cost. Of course other factors that must be taken into consideration are availability of gaseous fuels such as liquid propane or natural or manufactured gas and whether local regulations permit the use of gasoline in a confined area.

The advantage of diesel power is its lower cost of fuel and lower fuel consumption per kilowatt hour. Its initial cost is considerably higher. The advantage of gasoline is its lower initial cost and the ready availability of fuel and service; but because of local regulations regarding the use of gasoline, it can be

disadvantageous to plan for the use of a gasoline engine. Fuels such as natural gas offer reduced maintenance cost because of minimum carbon formation, less sludge formation in the oil and less valve grinding. There is no tetraethyl lead to foul up the spark plugs and no wash down of cylinder walls during starting. Disadvantages are that operation costs a little more than gasoline (in the Northeast area) and the availability of fuel may be limited.

The same advantages are available for liquid petroleum gas but since LPG is heavier than air and is highly combustible, it comes under strict Underwriters' regulations. You should check carefully before you consider using this type of fuel. The storage of sufficient quantities and its hazardous qualities make it more difficult to use.

Since the use of fuel is not on a regular monthly basis (you use only small quantities of gas for an emergency generator unless you have a power failure), many propane companies will require you to purchase the tanks. Also, as the temperature goes down, the rate of vaporization from the liquid drops. Hence the colder the weather the more surface area you need in the tank to supply sufficient quantities of gas. On a zero degree ambient temperature day, it takes a large tank to vaporize gas fast enough to supply units from 15 KW up with needed fuel. In larger units it soon gets to the point where you must

use a heat exchanger. With a heat exchanger the liquid propane passes through a heated coil and is vaporized, readily supplying the necessary fuel.

In many states and communities you cannot bring liquid propane into any building unless it is a separate building remotely located and of fire proof construction. Hence the use of a heat exchanger may necessitate construction of a special building, which in most cases makes it financially unwise to consider. If you are located in an area where ambient temperatures rarely drop below 50°, then some of these disadvantages of propane are not as pronounced.

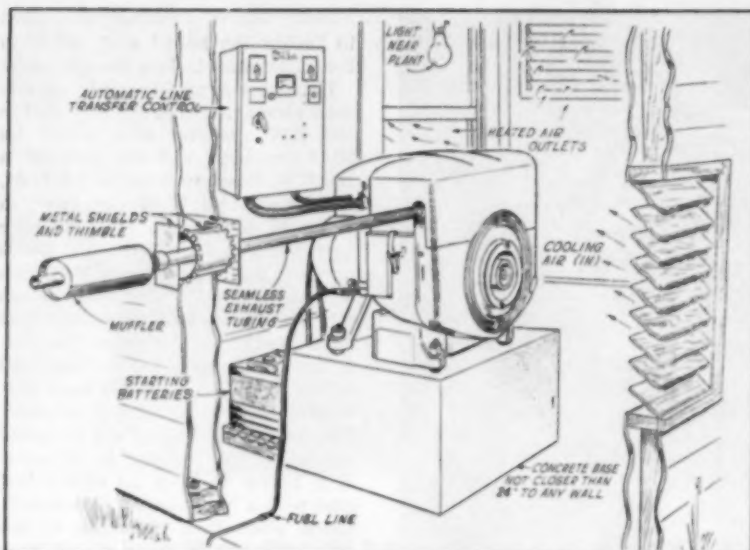
### Ventilation and Exhaust

Ventilation and exhaust systems and fuel supply each must be considered individually. The conditions of the room in which the unit will be installed are all important. You must make arrangements to bring cool air into the room and discharge heated air out of the room. If not, the unit will heat up very shortly and shut itself down. You must make proper arrangements to pipe the exhaust out of the building and up the building to a safe point for discharge. The sizing of this line is important; also the location of the exhaust line can mean architectural appearance problems unless carefully considered.

The placement of the fuel storage tank must be carefully planned. If it is above the level of the unit,



● CONFERENCE on standby power problems finds author, left, in drafting room of Vogelbach & Bauman, consulting engineers. At center is Arthur Ruger, Head Electrical Engineer, and at right H. C. Winters, who is in charge of the Electrical Division.



Courtesy D. W. Oman & Sons Inc.

● MANUFACTURER'S diagram shows details that must be considered in the selection and installation of an air-cooled electric generating plant for standby power.

there can be siphoning problems and too much head pressure on the carburetor. If it is too far away from the unit or too far below the fuel pump level, it will require too much fuel lift.

#### Transfer Control

The installation of a transfer control is another factor to be considered. This control is nothing more than a double throw switch which connects the electrical load either to the utility lines or to the emergency generator. Utility companies not only require the use of this equipment but in most cases supervise their installation. This is readily understandable, since utility personnel have been killed by working on lines that they thought were dead, but were being fed by a generator that wasn't properly installed.

There are two basic types of transfer controls. The manual transfer switch is used to transfer from one source to another by throwing the contacts by manual operation after the generator has been started by manual control. An automatic transfer switch accomplishes all this by relays within itself, and does not require the attention of an operator. With automatic transfer switches the power outage can be limited to ten seconds.

Because of the added cost of an automatic transfer switch, which may range from three hundred to several thousand dollars, they are not used on every installation.

Generally speaking, to justify the

cost of an automatic transfer control the requirements must fall into one of two categories: 1) Situations where the need of uninterrupted power is of prime importance, such as in a hospital; and 2) when equipment is unattended for several hours a day or remotely located and health or safety is at stake. A sewage pumping station or a water pumping station would be a good example. Also falling in this category would be theatres and public buildings where people could panic in total darkness. In other words,

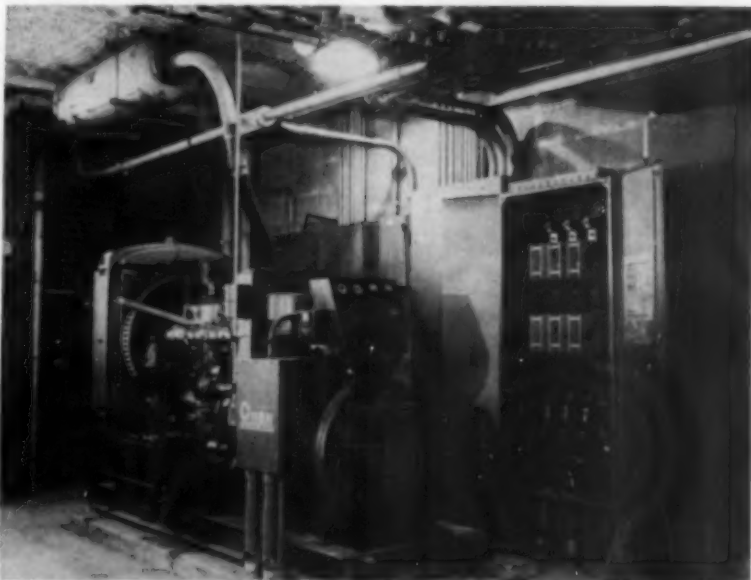
wherever uninterrupted power is of prime importance, the cost is justified.

There are many accessories that can be added to an automatic transfer control. One is time delay stopping, which means that the utility power must be restored for a predetermined time before the generator shuts itself down. There is also time delay starting, with which the power must be off for three seconds before the generator starts. This prevents starting on flash outages. An exerciser for the generator also is available. This starts the unit periodically and exercises it to keep it in good running condition. Such an accessory would be helpful in an unattended installation but is completely unnecessary where qualified personnel are available to service the equipment properly.

#### Typical Installations

Let us assume that we are working with a consulting engineer on a municipal sewerage system and that we have three places that require emergency generators. These are a pumping station with a load of 150 KW, the sewage treatment plant with a 230 KW load, and an administration building with a 10 KW load.

Cooling is the first consideration. Since heated air can be removed conveniently from the administration building by ducts, a 10 KW air cooled unit will be selected for this installation. The other two units will be water cooled because of their size.



● INSTALLATION at Chilton Memorial Hospital, Pompton Plains, N. J. This 113-KW unit has automatic transfer switch and hospital type silencer for noise control.



● ARROW points to housing for 25 KW standby engine and generator for Madison, N. J., Township Central Park sewage treatment plant. Transfer equipment is manual.

Turning to fuel selection, we find that in the administration building, with a 10 KW load a diesel unit would cost approximately \$1,000 more than a gasoline unit. Since this unit is being used as a standby power supply, it is very difficult to justify this additional expense. The fuel consumption rate on a diesel unit of 10 KW capacity is 1.3 gallons per hour at full rated load. For a gasoline unit it is 1.9 gallons per hour at full load. Figuring 16¢ a gallon for diesel fuel and gasoline (less road tax) at 22¢ a gallon, the cost of operation is approximately 21¢ per hour for diesel and 42¢ for gasoline per hour.

While the cost of operation for gasoline is about double that of the diesel, it would take many hours of running time to justify spending the additional money to install a diesel unit of this capacity for a standby application. On the other hand, if this installation was for a primary source of power, the extra initial expense would be a good investment.

Servicing is another factor. The cost of maintenance would be a little less for a diesel unit because it does not have points, plugs and condensers, but it may be easier to get service on a gasoline unit because many mechanics are more familiar with gasoline engines than with diesels. Thus many factors are heavily in the favor of the gasoline fuel unit.

Before making a final decision we should investigate gaseous fuel such as natural gas. Generally speaking,

we can convert a gasoline engine to operate on liquid propane or natural gas for about the same amount as it would cost to buy a gasoline tank, so there is no marked price differential in the initial installation.

Natural gas, which is generally 1000 to 1100 Btu, will operate at nearly full efficiency and will develop the full power of the unit. Natural gas and other gaseous fuels are very clear burning and leave no carbon deposits so the life of the engine is longer. The cost of operation will average a trifle more for natural gas than for gasoline, though this may vary from one region to another. Fuel consumption on natural gas will be 190 cubic feet per hour for the 10 KW engine. If natural gas is available, it may be a wise choice. However, when using manufactured gas with a 604 or 800 Btu rating with a low pressure system your engine may not develop full horsepower. This again is a reason for keeping the horsepower ratio as high as possible. With higher horsepower ratings, it is possible to get full ratings from generators even with 604 Btu gas.

For the 150 KW unit for the pumping station the factors of gasoline versus diesel power are very nearly the same. There is \$1,000 difference in cost between the gasoline unit and diesel unit. The fuel consumption for the diesel unit is 14 gallons per hour at full rated load and the gasoline consumption is 23.7 gallons per hour. Since this is used for standby and not as a

primary source of power, it is hard to justify the added cost, although the difference is less pronounced.

Using the same fuel costs considered above, the cost for fuel on the 150 KW gasoline unit would be \$5.22 per hour and the cost for a 150 KW diesel unit would be \$2.24, a difference of \$2.98 per hour in favor of the diesel. The average unit will run from 50 to 100 hours per year, so on the basis of 100 hours of operation there is a fuel savings for the diesel unit of \$298.00 per year. Naturally the more the unit is used the more the savings will be. A factor to be taken into consideration at this point is whether the community can afford to spend the additional money or whether it is better to have an added fuel cost with a lower initial investment. Quite often it is preferred to use gasoline units of this size and have the added fuel cost.

To use natural gas for a unit of this capacity, it would be necessary to have a 3-inch gas line run to the unit if the gas line is not over 100 feet long and a 4-in. pipe if the line is up to 300 feet long. The fuel consumption would be 2700 cubic feet per hour. Before giving consideration to the use of natural gas for such a large unit, it would be necessary to determine whether the utility company has sufficient gas available at your location and if it can be supplied at the necessary pressure of four to six ounces.

If 604 Btu manufactured gas must be used, other factors become pronounced, such as derating the KW output of the unit because of low efficiency of the engine with the low Btu rating of the fuel being used. Generally speaking, it is not advisable to use a unit this large on 604 Btu gas unless other things make the use of gasoline or diesel inadvisable.

Finally we must consider the treatment plant and with a load of 230 KW. Here it is clearly advantageous to use diesel as a fuel. With a unit this large, the cost of a gasoline engine is more than the cost of a diesel engine and all the advantages of using a gasoline engine have disappeared. Since we are only converting a gasoline engine when we use natural gas, the same factors hold true for gaseous fuel.

This article is intended as a guide, and to point out some of the more common problems that may arise in standby installations. The necessity for complete reliability in an engine and/or generator demands both technical knowledge and the best possible equipment.



## FOR THAT NATURAL LOOK

**BERNHARD A. ROTH**

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Soil Conservation Service

United States Department of Agriculture

Upper Darby, Pennsylvania

**T**HE WAR-INSPIRED term, VIP, may mean very important person to most people but the Connecticut Highway Department has its own definition. It is: *very important plants*. At the moment, none is more important than a few dozen, very special shrubs growing timidly but surely on selected embankments along the Constitution State's Interstate Highway System.

Their slender, woody shoots, groping toward the sun, were started directly from seed, rather than from the usual plantings of 15 to 18-inch nursery stock. If the plants establish and thrive, a new era in highway vegetation and maintenance may begin. If they don't, chief mourners will be William C. Greene, landscape engineer for the highway department, and Wilson O. Hill, plant materials specialist for the U. S. Soil Conservation Service. But they'll probably go on trying. They're geared for the long haul—woody vegetation takes its own sweet time.

Several years have already elapsed since the Connecticut Highway Department and SCS got together. Their mutual aim is to select native shrubs and direct-seeding techniques that will be useful on the long miles of road between

towns and interchanges. Functional plantings from nursery stock will continue to enhance rights-of-way through communities in Greene's belief. They will also serve special purposes such as driver-visibility and road-outlining at access points.

In the meantime, a successful direct shrub-seeding program could chop an immense slice off Connecticut's current road-scaping costs. Greene puts a value of \$1 to \$5 on each woody plant growing by the wayside; \$12,000 to \$25,000 for each running mile of highway successfully grassed and shrubbed. Close to 300 miles are embraced in just the Constitution State's expanding Interstate work. Fractional savings per mile would amount to a startling figure.

Approaching SCS through its state office at Storrs, Greene found the Federal agency eager to cooperate. The Soil Conservation Service has been searching out new plants and planting techniques to protect soil for a quarter of a century, according to State SCS Conservationist, N. Paul Tedrow. The agency's background included getting things to grow on such improbable sites as the dust bowl, strip mine spoil and sand dunes all over the U. S. A. Here would be a chance to experience a new twist in revegetation.

### Initial Trial

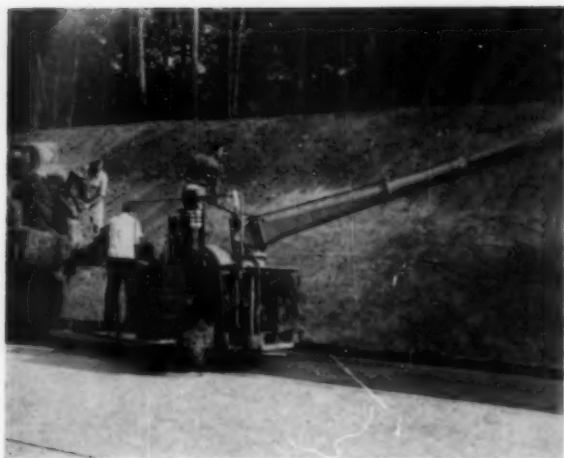
And "experience" of a hopeful sort precisely describes the venture to this moment. Disaster befell an initial fall seeding of trial shrubs. A heavy winter melt-off of snow

and ice ripped through the test bankings, taking most of the seed with it. That following spring and fall, Connecticut highway personnel and technician Hill doggedly repeated their experimental seedings, bearing in mind that germinating, growing and beginning to look like anything is a three or four year proposition with most shrubs.

On an April morning, recently, landscapers and conservationists could utter a few restrained huzzas. Crawling up and down several test plots while puzzled motorists whizzed nearby, they singled out first one skinny shoot—then another—and another. Survivors of the ill-starred wash-out! Thus did two species of rose—*wichura* and *multiflora*—join the elite of Connecticut's *very important plants*. They are doing nicely.

Greene and Hill have broadened their trials to include a score of common and native shrubs. Their thought is to have the countryside look as naturally wild and lovely as ever, after the road-builders have moved on. Mainly, they are working with species that New Englanders have known in their woods, farmlands and backyards for centuries. In addition to roses, therefore, they are seeding sumacs, shrub, dogwoods, bush honeysuckles, bayberries, bush lespedezas, sweet fern and viburnums.

Also being checked are several methods of direct seeding. These are: spot-seeding in holes filled with topsoil; spot-seeding in raw fill material; broadcast on fill mate-



● **PLANTINGS** from seed along Connecticut highways have shown promise. Here a blower is spreading mulch on a bank.



● **COMPARING** results obtained from several shrub-seeding techniques. Shown above are Messrs. Hill, left, and Greene.

rial, with and without added grass seed; hydro-seeding in a slurry mixture including grass seed, fertilizer and water. Commonly, the seedings are mulched with asphalt-sprayed straw.

#### May Cut Mowing Cost

If the plots grow as hoped, shrubs will occupy all areas being stabilized except an 8 to 10-foot grass border

next to the pavement. It is hoped that woody vegetation will help reduce the highway mowing bill. Will it work, or won't it? Specialist Hill and the SCS are gambling that it's a worthy attempt to control erosion, improve land and even help wildlife in the national program of soil and water conservation.

Hearing of the Connecticut adventure through professional grape-

vines, Minnesota and New Jersey highwaymen have, in the past few months, organized their own direct shrub-seeding efforts.

Says "road-scaper" Greene: "I'm satisfied that if we get as little as 10 percent of our seedlings to catch and grow, the payoff will show a profit and the desired effect along highways. Surely, that's not setting our sights too high."

## Emergency Crew Follows Donna to Repair Florida Keys Pipe Line

**T**HE NAVY took in its stride the problems created by Hurricane Donna and even before the storm had run its course, machinery was

set in motion to repair the 125-mile water line extending from the pumping station in Homestead, Florida, to the tip of the badly bat-

tered Florida Keys. (See **PUBLIC WORKS**, October, 1960).

The Navy dispatched a plane to the Bradford, Penna. plant of Dresser Manufacturing Division, to obtain one hundred 16-inch water-line couplings for air lift into Miami.

Tuesday, September 13, reconstruction was started. Sections of pipe were recovered from the sea and the land, and wherever possible were reused. Crews worked at four different repair locations at one time, and radio contact was maintained with the Naval headquarters and between the various repair sites. By Friday afternoon the last section of pipe was lowered into place, and coupled; the water was chlorinated and tested, and by Monday morning naval and civilian personnel once again enjoyed uncontaminated and ration-free water.

• • •

#### Cost of Meter Repairs

The Water Department of Seattle, Wash., reports that, for 1959, the direct cost of meter repairs was: For 1/2-in. meters, \$3.37; for 3/4-in., \$4.34; for 1-in., \$3.43; for 1 1/2-in., \$6.20; for 2-in., \$10.89; and for 3-in., \$14.20.



● **SECTION** of recovered pipeline is hauled out of the water and put in place.

Photo courtesy Dresser Mfg. Div.

# NEW AQUEDUCT WILL BRING MORE WATER TO FOUR CITIES

**C**ONSTRUCTION of the 50.8-mile Foss Aqueduct, which includes Clinton, Bessie and Cordell Laterals, a major feature of the Bureau of Reclamation's Washita Basin Project in western Oklahoma, began in September under a \$3,826,244 contract awarded to the Vinson Construction Company of Phoenix, Arizona. The contract is scheduled to be completed 800 days after receipt of notice to proceed.

Foss Aqueduct is one of the most complex water conveyance structures to be undertaken by the Bureau for a municipal water supply system. It embraces a diversity of pipe sizes, numerous railroad and highway crossings, 3 pumping plants, 3 storage tanks, 6 surge tanks, and appurtenant features. The aqueduct is being constructed to increase the supply of municipal water to four Oklahoma cities—Clinton, Bessie, Cordell, and Hobart. The source of the water supply for the aqueduct is to be the reservoir behind Foss Dam, now under construction on the Washita River, 12 miles northwest of Clinton.

In addition to providing storage and conveyance of municipal supplies of good quality water, the Washita Basin Project will also make available water for irrigation of Washita River bottom lands. Irrigation will greatly increase the yield of crops produced on project lands, particularly during dry years. The Washita Basin has a long history of frequent uncontrolled destructive floods, which will be reduced by Foss and Fort Cobb Dams, principal features of the project.

Surveys of 1946 and 1951, of the water supply facilities of 35 towns and cities in or immediately adjacent to the Washita River Basin, indicated that 27 of these municipalities obtained their water supply from ground-water sources; four derived supplies from relatively small reservoirs on tributary streams; two pumped directly from the unregulated flow of the Washita River; and two utilized both underground sources and surface water stored in tributary reservoirs. In 1943, the National Resources Plan-

ning Board issued a report indicating that a system of multiple-purpose reservoirs was required, not only to provide for existing and prospective needs for flood control, irrigation, municipal and industrial water supplies, but also to obtain important benefits through sediment control, recreation, and fish and wildlife conservation. In 1945, the Bureau of Reclamation began its investigations. The project was authorized by the Congress in February 1956.

In addition to the transportation of municipal and industrial water supplies from Foss Reservoir to the four Oklahoma cities through the

Foss Aqueduct, water will be released from Foss Reservoir for irrigation purposes. A supply of reservoir water has also been reserved for the military installation at the Clinton-Sherman Air Force Base.

The Foss Reservoir Master Conservancy Districts has contracted with the Bureau of Reclamation for repayment of costs of construction of the Foss Aqueduct. The District will assume operation and maintenance of the aqueduct system after construction is completed.

## Planning

In planning for the project's future needs the Bureau of Business



● LOCATION map shows general location of Washita Basin Project (inset map) and Foss Dam, proposed gravity canals and aqueducts and laterals to the various cities.

Research of the University of Oklahoma, under contract with the Bureau of Reclamation, made a survey of the upper Washita Basin. The University used the resource-base approach to population trends to determine potential municipal and industrial requirements of various principal communities through the year 2010. The detailed report of the survey contained an appraisal of future population and water requirements expected for the cities of

ones, together with the water consumption trends of the industries. Estimated water requirements of Bessie and the Clinton-Sherman Air Force Base were furnished, respectively, by officials of the town and officials of the base.

The University report summarized the following data: the population of Clinton by the year 2010 would be 23,300, and the total water use would be 5.04 mgd; the population of Cordell by the year 2010 would be

Railway. The aqueduct will then run southward to Bessie, Cordell, and Hobart.

The aqueduct will traverse the extensively cultivated flood plain of the Washita River from Foss Dam to near the town of Clinton. The remainder of the aqueduct will traverse areas of generally fair to good soil. Construction of the aqueduct system will require right of way easement of about 500 acres.

Three laterals branching off the main aqueduct are to be constructed to extend, respectively to the towns of Clinton, Bessie, and Cordell. The Clinton Lateral will branch off from a bifurcation structure about 10 miles from the beginning of the aqueduct and will run 3.3 miles in a northeasterly direction to Clinton. The lateral will be a 30-inch concrete pressure pipe and will have a capacity of 11 cfs. Bessie Lateral, connecting to the aqueduct about 9 miles south of the Clinton Lateral and about 18 miles from the beginning of the aqueduct, will be 1.2 miles long, extending to the town of Bessie. This lateral will be 4-inch-diameter steel pipe and will have a capacity of about one-tenth cfs. The Cordell Lateral will branch off 24 miles from the beginning of the aqueduct, or about 6 miles south of the Bessie Lateral. The Cordell Lateral, extending to Cordell, 0.23 mile, will be 10-inch steel pipe with a capacity of 2.62 cfs.

The aqueduct will be constructed of concrete pipe having diameters varying from 42 inches to 18 inches. The first 9.35-mile section of the aqueduct will be 42-inch pipe having a capacity of 19.72 cfs. The next section, 1.77 miles long, will have a diameter of 30 inches and a capacity of 8.72 cfs. The third section, 18.54 miles long, will have a diameter of 27 inches and a capacity varying from 8.72 cfs to 6.03 cfs. Remaining sections of the aqueduct, all having a capacity of 6.03 cfs, will include, in downstream succession, pipe of the following dimensions: 21-inch 2.5 miles; 18-inch 1.9 miles; 20-inch 4 miles; 21-inch 5.7 miles; and 18-inch 5.9 miles.

The contract for the aqueduct calls for 199,600 linear feet, or 37.8 miles, of concrete pressure pipe in the 42, 30, 27, 21 and 18-inch diameters, and 61,300 linear feet, or 11.6 miles of cylinder prestressed concrete pipe in the 30, 27, 21, 20 and 18-inch diameters. The reinforced concrete pressure pipe is to be manufactured to withstand hydrostatic heads varying from 25 feet to 150 feet depending on the diameter of the pipe. The designs call for exter-



All photos courtesy Bureau of Reclamation

● **EMBANKMENT** construction progress is shown in view of work on the downstream cutoff trench at Foss Dam. Structure is earth fill, 134 ft. high, 18,000 ft. long.

Clinton, Cordell, and Hobart. Although the town of Bessie is included in the same trading area, the water requirement was not appraised individually in the University report because of the relatively small size in comparison with other communities in the trading area.

The area considered by the University report pertinent to the Foss Aqueduct was termed the "Elk City Trading Area" and included five Oklahoma counties, Beckham, Washita, Kiowa, Roger Mills and Custer Counties. It was assumed that all people employed in the area are supported either directly or indirectly by the basic industries. The future population was allocated to the major communities on the basis of their expected industrial development. A projection of the domestic per capita water use was then applied to the estimated future population to obtain the future domestic water requirements of the towns and cities.

The future water requirements of the basic industries in the area were determined by analyses of the present basic industries and possible new

6,300 and the total water use 1.14 mgd; the population of Hobart by the year 2010 would be 11,500 and the total water use 2.79 mgd.

### Design

Design of the Foss Aqueduct system was based on these projected water requirements. Design capacities provided by the Bureau of Reclamation will supply 150 percent of the year 2010 nonindustrial demands and 110 percent of the year 2010 industrial demands. Hourly peaking demands will be met by a local source to be provided by the water users.

The location of the Foss Aqueduct system was selected to facilitate access as well as to minimize right-of-way cost and damage to agricultural production. The aqueduct system is to extend from the municipal outlet works of Foss Dam southeasterly to the point where it first intersects the Panhandle and Santa Fe Railway, then is to run parallel to the railway to a point about 2½ miles southwest of Clinton. From this point the aqueduct is to continue southeasterly to the point where it intersects the Atchison, Topeka and Santa Fe

nal loadings of from 5 to 20 feet of earth over the top of the pipe, depending on the size. The acceptability of the pipe is to be determined by the results of hydrostatic pressure tests applied on units of pipe, by pipe joint leakage tests, by compressive strength of concrete in the pipe as determined by test cylinders and by inspection during or after manufacture.

The specifications list 2, 3, or 4 nominal wall thicknesses for each size of concrete pressure pipe with a corresponding requirement for circumferential reinforcement for each wall thickness. The contractor has the option of supplying the pipe in any of these wall thicknesses and the corresponding circumferential steel area, or he may supply pipe having other wall thicknesses in which case the required minimum circumferential steel area will be modified for each size of pipe. Wall thicknesses for the concrete pressure pipe will vary from 3¾ inches for the 42-inch to 2¼ inches for the 18-inch.

The cylinder prestressed concrete pipe is to withstand heads up to 320 feet and will be made up of a steel cylinder having an inside concrete lining and external reinforcement wire and a 1-inch external layer of brush coat concrete. The thickness of the steel cylinder for all four diameters of pipe will be 16-gage. Wall thicknesses will vary from 4¾ inches for the 30-inch to 3¼ inches for the 18-inch pipe. The concrete lining of the cylinder is to be centrifugally spun in place. After the lining is cured, the reinforcement wire will be wrapped around the cylinder and the outside concrete lining will be placed. No. 6 wire will be used as reinforcement, helically wound directly on to the steel cylinder at spacings varying according to the size of the pipe. The reinforcement wire is to be wound under a tension of 75 percent of the minimum ultimate strength of the wire.

The finished cylinders having joint rings welded on to each end are to be tested under hydrostatic pressures sufficient to stress the steel to 20,000 psi. The cylinder prestressed concrete pipe will be laid in maximum 16-foot lengths. Maximum laying lengths of the concrete pressure pipe will vary from 14 feet for the 18-inch to 24 feet for the 42-inch.

#### Pumping Plants

Foss Aqueduct is essentially a gravity flow system. However, three pumping plants are to be con-

structed to relift water at certain points in the system, requiring storage tanks, surge tanks, and other appurtenant pressure facilities. The pumping plants are to be located at 0.3 mile, 11.3 miles, and 29.9 miles downstream, respectively, from the beginning of the aqueduct. Pumping Plant No. 1, near Foss Dam, will have 3 vertical-shaft, deep-well pumps operating at a total capacity of 23.25 cfs and under a dynamic head of 52 feet. Pumping Plant No.

The conveyance system will include six surge tanks to minimize water hammer. Two of the surge tanks, downstream from Pumping Plant No. 3, are to be 10 feet in diameter and 92 feet high. The remaining 4 surge tanks will be 7 feet in diameter and have heights varying from 48 feet to 71 feet 6 inches.

The slope of the hydraulic gradient of the aqueduct was determined assuming the friction coefficient,  $C_{fs}$  (Scobey's formula) equal



● COMPLETED riprap at river outlet stilling basin. Storage capacity behind dam will be 430,000 AF of which 240,000 will be for municipal, irrigation and industry use.

2 will house 3 horizontal-shaft centrifugal pumps which will have a total capacity of 9 cfs and a dynamic head of 83 feet. Pumping Plant No. 3 will house 3 horizontal-shaft centrifugal pumps which will have a total capacity of 6 cfs and a dynamic head of 122 feet. All three plants are to have concrete substructures and masonry super-structures. The plants are to be constructed under a separate contract which is expected to be awarded during 1960.

Operation of the pumping plants will be unattended. Pumping Plant No. 1 will pump raw water, flowing from the outlet works at Foss Dam, to the aqueduct's water treatment plant. Water flowing from the treatment plant will enter a 155-foot diameter, 1.6-MG storage tank. From the storage tank, the water will flow to the Clinton Lateral bifurcation and to the main aqueduct. The flow will continue to Pumping Plant No. 2, where the water will be boosted to a 58-foot diameter, 250,000-gallon storage tank, then to the Bessie Lateral turnout to Pumping Plant No. 3. The water will then flow to a 48-foot diameter, 180,000-gallon storage tank, where it will pass to the terminal structure at Hobart.

to 0.370 for the 27-inch and 30-inch pipe and 0.345 for the 21-inch and smaller pipe. Air valves or vents are to be provided at the highpoints of the aqueduct and blowoff valves are to be provided at the low points. In addition, manholes are to be placed so as to provide access to the aqueduct pipe at intervals of 2,000 feet for pipe 27 inches and larger.

The water treatment plant for the aqueduct, to be constructed a short distance downstream from Pumping Plant No. 1, is being designed by consulting engineers retained by the Foss Reservoir Master Conservancy District. The plant will have a capacity of 9 mgd and will provide full treatment and chlorination facilities for the aqueduct system.

#### Crossings

The main aqueduct and the Clinton Lateral each have four railroad crossings. Proceeding southeastward from Foss Dam, the main aqueduct intersects the Panhandle and Santa Fe Railway twice, the Chicago, Rock Island, and Pacific Railroad, and the Atchison, Topeka and Santa Fe Railway. From its bifurcation with the main aqueduct, the Clinton Lateral, running northeast, intersects,

in turn, the Panhandle and Santa Fe Railway, the Chicago, Rock Island and Pacific Railroad, the Panhandle and Santa Fe Railway and the Atchison, Topeka and Santa Fe Railway.

For seven crossings, 10-gage, 48-inch corrugated metal pipe, and for one crossing 8-gage, 66-inch corrugated metal pipe is to be placed as casing beneath the railroad tracks. The aqueduct pipe will then be threaded through the casing and ac-

The casing to be installed for the four aqueduct highway crossings may be either concrete pipe or corrugated-metal pipe. The aqueduct pipe will be threaded through the casing and accurately aligned in the center of the casing. Similar to the railroad crossings, sand bedding will be placed between the aqueduct pipe and casing up to the horizontal diameter. Redwood bulkheads will be constructed at the end of the casings. For the Clinton Lateral

completed in November 1959. The dam is on Pond (Cobb) Creek, five miles north of the city of Fort Cobb. The earthfill structure has a height of 101 feet, a crest length of 9,900 feet, and a volume of 3,568,600 cubic yards. The spillway capacity is 3,100 cfs. The reservoir has a capacity of 145,100 acre-feet.

Water stored in Fort Cobb Reservoir will be released to the Anadarko Aqueduct which will convey water, for municipal and industrial uses, to the cities of Fort Cobb and Anadarko and to the Western Farmers Electric Cooperative. Releases of water from Fort Cobb Reservoir for irrigation will be diverted to project lands from the Washita River downstream from the reservoir. The Anadarko Aqueduct comprises 17.9 miles of 33, 30, and 27-inch concrete pipe, 2.0 miles of 18-inch concrete pipe for the Western Farmers Electric Cooperative Lateral, and 1.1 miles of 15-inch concrete pipe for the Fort Cobb Lateral. Construction of the Anadarko Aqueduct began in February 1959, and is scheduled to be completed in 1960.

The total cost of the Washita Basin Project to be repaid to the United States, exclusive of the irrigation features, are the capital costs allocable to municipal and industrial water supplies for Clinton, Bessie, Cordell and Hobart consisting of construction costs plus interest during construction, and the reservoir construction costs allocable to municipal and industrial water supply for the Clinton-Sherman Air Force Base, together with operation and maintenance costs. Interest during construction on the Foss Dam and Reservoir investment allocable to the Air Base would not be charged the Federal installation. The costs allocated to municipal and industrial water supply are to be repaid over a period not to exceed 50 years from the date water is first delivered to the project cities, with interest on the unpaid balance at a rate certified by the Secretary of the Treasury.

Foss Aqueduct is in the Bureau's Region 5; L. W. Hill is Regional Director at Amarillo, Texas. C. O. Crane at Clinton, Oklahoma is Washita Basin Project Manager and Bert Levine at Clinton, Oklahoma, is Construction Engineer for Foss Dam and Aqueduct. Design of the aqueduct was completed under the direction of Grant Bloodgood, Assistant Commissioner and Chief Engineer. Floyd E. Dominy is Commissioner of the Bureau of Reclamation; his office is in Washington, D. C.



● INTAKES: Intake for canal outlet is shown at the left. The other four are for municipal water supply. Started in 1958, completion of Foss Dam is set for late 1961.

curately aligned. Sand bedding is to be placed between the aqueduct pipe and the casing up to the horizontal diameter. Redwood bulkheads are to be constructed at the ends of the casings.

Part of the metal pipe casing for the crossings under the Rock Island Railroad on the main aqueduct and the Clinton Lateral may be installed by open-cut excavation. However, the central portion of the casing is to be jacked under the tracks. The casing may be installed by open-cut excavation or by jacking on the two aqueduct crossings of the P&SF Railway and the two crossings of the same railroad for the Clinton Lateral. Open-cut excavation or jacking may be used by the contractor in installing the crossings of the Santa Fe on both the main aqueduct and the Clinton Lateral.

The contractor is also required to construct four highway crossings for the main aqueduct and one highway crossing for the Clinton Lateral.

highway crossing, the 30-inch pipe will be installed through an existing 48-inch corrugated metal pipe running beneath the highway. Sand bedding will be placed between the lateral pipe and casing.

#### Dam Design

Foss Dam is to be an earthfill structure 134 feet high and 18,000 feet long at the crest. It will have a volume of 10,591,000 cubic yards. The spillway will have a capacity of 3,700 cfs. The dam, placed under construction in October, 1958, is now about 72 percent completed, and is scheduled for completion by November, 1961.

Foss Reservoir will have a total storage capacity of 430,000 acre-feet, including 240,200 acre-feet for municipal and industrial water supply and irrigation, 177,000 acre-feet for flood control, and 76,000 acre-feet for sediment deposition.

Construction of Fort Cobb Dam began in February 1958 and was

# ONE-MAN LANDFILL

## SERVES 35,000 PEOPLE

**ONE MAN** and one machine maintain the City of Janesville, Wis., sanitary landfill that serves a 12-square mile area with a population of 34,895.

According to Janesville City Manager Joseph Lustig, labor, equipment and materials for this remarkable one-man landfill cost \$21,343 during 1959. This year's cost will probably be about the same, he adds.

The dumping grounds cover 12 acres and include an old gravel pit. They were purchased by the city in 1949 for \$1,000 and were put into use in 1954. Since two acres are filled yearly by the area method, the present site has been virtually filled and another old gravel pit has been lined up for use as a new location.

Maximum fill depth on the present site is about 50 feet. Refuse is spread in a 20-inch layer, and covered each day with 18 to 24 inches of sand and gravel. A Caterpillar No. 977 Traxcavator, operated by 64-year-old Ray Koch, spreads refuse and covers it. Koch also loads sand and gravel into city trucks.

Altogether he runs the No. 977 from 7 a.m. to 5 p.m., six days weekly. While the average city employee worked 2,340 hours last year, Koch tallied 3,000. Supervision is by Arthur Badger, City Superintendent of Public Works.

Sanitary landfill is the only disposal method used in Janesville. Scavenging is not permitted. Private dumping is allowed at no charge during the same hours that Koch works.

Separate collections of refuse and garbage are made without charge once a week by city employees and equipment from 10,000 residences. One 15-yard and two 17-yard Leach Packmasters make the weekly refuse pickups at the curb, while garbage is collected by two 15-yard Leach Packmasters and a 13-yard Garbage Getter. Average haul length for these units is 2.4 miles.

A total of 2,724 loads, or 43,326 cubic yards, of rubbish was collected from the curb in 1959 at a total cost of \$48,446 (\$1.118 per cubic yard). A 1½-ton Chevrolet truck,

plus a 15-yard Packmaster and a 13-yard Garbage Getter, assisted the regular rubbish-pickup crew when necessary.

Garbage collection totaled 1,243 loads (18,413 yards) last year at a cost of \$40,811.70, or \$2.216 a cubic yard. During the week, two 3-man crews collect garbage, while three 2-man crews work Saturdays.

the pit act as a wind tunnel if downhill dumping, from the entrance side of the pit, were utilized.

The separate sections help to prevent traffic congestion in the landfill. Since the wet garbage and rubbish dumping areas are on opposite sides of the landfill, sand and gravel to cover dumped material are obtained from two separate loca-

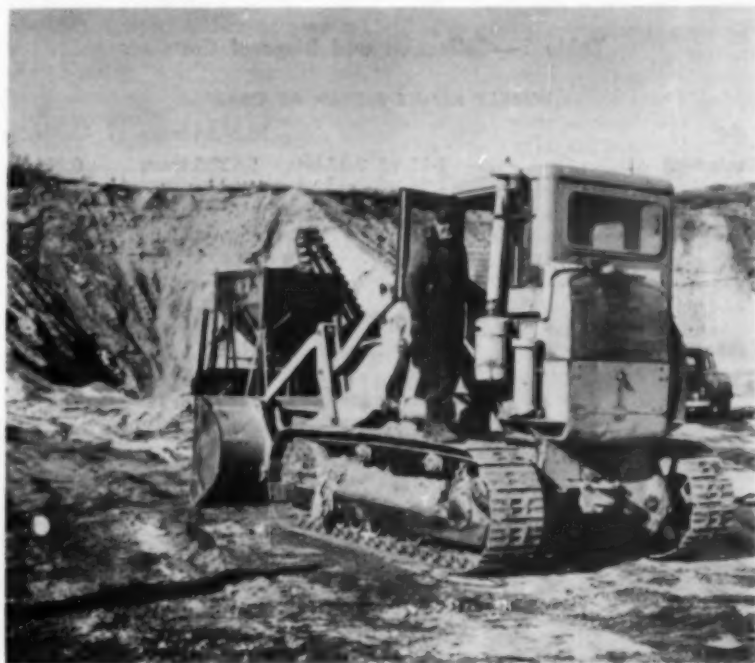


Photo: Courtesy Caterpillar Tractor Co.

● **ONE MAN** and this machine last year handled over 43,000 cy of refuse and some 18,000 cy of garbage. After compaction, refuse is covered with 18 to 24 ins. of earth

Three separate locations are provided at the grounds for burnable trash, wet garbage and rubbish. Garbage is dumped by the No. 977 into a low section of the fill, while rubbish is pushed uphill by the No. 977 over previously filled area. Burnable waste is emptied from trucks on the entrance road over the face of a cliff overlooking the dumping grounds.

Rubbish is dumped and compacted uphill due to prevailing winds from the south which would make

tions. Each is 10 to 100 feet from the trash to be covered, thus minimizing travel distance and cycle time.

In general, brush is the only trash burned. Brush is difficult to bury because it springs up after compaction and creates voids in the fill. Materials which create noxious smoke are not burned. Tires are given to the county to assist in burning brush on site.

City Manager Lustig, who has held the position of City Engineer and Director of Public Works with



● EACH DAY, the refuse that has been deposited is compacted and well covered with earth. Only brush can be burned.



● SPREADING and compacting are basic to a satisfactory landfill. To prevent future settlement fill depth is limited.

**Table 1—Collection and Disposal Costs**

**WEEKLY REFUSE PICKUP AT CURB**

Labor		18,888.5 hours	\$ 41,727.50
Equipment	1-15 yd. 2-17 yd.	5,532.5 hours	6,251.73
	1-15 yd. 1-13 yd.	327.0 hours	327.00
	1½ ton Chevrolet	70.0 hours	140.00
	Equipment Total		\$ 6,718.73
Total Cost of Refuse Pickup			\$ 48,446.23

**WEEKLY GARBAGE PICKUP**

Labor			\$ 35,871.05
Equipment	2-15 yd. Packmaster	4,935.0 hours	4,935.00
	1-13 yd. Garbage Getter		
	15 yd. Packmaster	5.0 hours	5.65
	Equipment Total		\$ 4,940.65
Total Cost of Garbage Pickup			\$ 40,811.70

**MAINTENANCE OF SANITARY LANDFILL DUMPING GROUNDS**

Labor		3,239.5 hours	\$ 7,648.44
Equipment	Trucks	9.0 hours	18.00
	Flusher	2.0 hours	5.00
	Hough Loader	3.0 hours	21.00
	Hopto Digger	2.0 hours	8.00
	Trojan Loader	1.5 hours	7.50
	Roller	2.0 hours	8.00
	Athey Loader	10.0 hours	50.00
	Austin Western Grader	3.5 hours	24.50
	Traxcavator HT6 ('55)	1,514.5 hours	7,764.00
	Cat Grader	1.0 hours	7.00
	Trailer	9.5 hours	23.75
	Traxcavator 977 ('56)	1,007.5 hours	5,538.00
	Equipment Total		\$ 13,474.75
Materials	Telephone		154.40
	Refuse Containers		66.16
	Material Total		220.56
Total Cost of Dumping Grounds			\$21,343.75
Grand Total Disposal Costs			\$110,601.68

the city of Janesville for more than 30 years, says there are no current plans for future use of the land created by the covered fill. However, one end of it is now being used as a parking area for an asphalt surfacing plant.

Proof that the landfill causes no smoke, odor or vermin problems can be seen in its nearness to the attractive Parker Pen Plant less than a quarter of a mile away. The Parker layout in Janesville recently won a national industrial landscaping award.

**Cost Details**

A breakdown of 1959 sanitary landfill costs, as provided by City Manager Lustig, are shown in Table 1.

Janesville's Caterpillar HT6 Traxcavator recently was traded for a new Cat No. 977 Traxcavator. The city's three-year old No. 977 replaced the HT6 on the landfill, while the newly purchased unit is used primarily for street construction and repair. Other machines are listed in Table 1 under equipment in the breakdown of landfill maintenance costs. These were brought in for short periods to accomplish miscellaneous tasks such as road grading and improvement.

Complete cost figures covering the past four years show that the HT6 has worked a total of 7,479 hours, during which the actual maintenance and operational costs (not including operator wages or depreciation) has totalled \$25,726.37 or \$3.44 per hour. Similarly, during the same 1956-1959 period the No. 977 worked 4,286.5 hours at a cost of \$14,938.70 or \$3.49 per hour.

# REPAIR

## of a Disintegrated Bridge Deck

**ANDREW ADAMS**

Research Engineer  
Maine State Highway Commission  
Augusta, Maine

MIDDLE BRIDGE in Dresden, Maine, built in 1936, showed numerous signs of disintegration. The curbs had been repaired several times and the disintegrated area of the concrete wearing surface had been covered with bituminous cold patch material. In the spring of 1959, the Dow Chemical Company of Midland, Michigan, offered to furnish to the Maine State Highway Commission, latex and epoxy resin materials along with a technical advisor, free of charge, for the repair of the wearing surface on this bridge. The offer was accepted and in August, 1959 the repairs were carried out. The roadway of the bridge was approximately 294-ft. long and 22-ft. wide.

A bridge maintenance crew repaired the curbs and removed the disintegrated areas of the wearing surface. An inch or more of concrete was removed from around the drains in order to "key in" the latex-modified mortar. Tar or as-

phalt which had been tracked onto the bridge from the approaches was removed by heating with a torch and scraping with a putty knife, paint scraper, or sharp-edged shovel, but a heavy stain still remained.

Following this operation, grime, grease, and oil stains were removed by sand-blasting which gave the roadway surface the appearance of new concrete. This part of the work was done by subcontract. A tent, enclosing three sides of the sand-blasting operation, was used to keep the dust from annoying traffic. One traffic lane was completed at a time (including the placing of the latex modified mortar) before moving to the other lane. The operation of sand-blasting was more efficient on a dry wearing surface and the sand also needed to be dry to avoid clogging. About seven tons of Ottawa sand, passing the 20 and retained on the 30 mesh sieve, were used. A large portion of the sand was recovered, sieved over a fly screen and used a second time.

Metal screed bars,  $\frac{1}{2}$ -in. deep by 1-in. wide, were laid the full length of the bridge along the longitudinal construction joint and attached to the floor at 3-ft. intervals with

screw anchors and countersunk screws. A wooden filler of the same size as the metal screed bar was attached to the floor in the same manner at each cross joint.

The concrete wearing surface was flushed with a hose preceding the placing of the latex modified mortar. Dow Latex 560 and Experimental Latex X-2144 were each used in this project with Dragon Type II cement and natural sand, meeting the requirements for use in Portland cement concrete.

### Properties of Latex

The Latex 560 is a water dispersion of styrene/butadiene copolymer particles, in other words, a type of synthetic rubber. When the water evaporates, the particles coalesce and air-dry to form a clear elastic film. The Dow Latex X-2144 is described as a new saran-type latex which imparts physical improvements to Portland cement mortars.

The mortar was mixed for three minutes in a one-bag mixer. Anti-foam "B", a silicone product manufactured by Dow Corning Company, was added to each 55-gal. drum of latex to prevent foaming and to control the amount of entrained air in



● REPAIRED BRIDGE DECK with latex-modified mortar patches in place provides uniform surface and carefully sealed joints.



● **SAND BLASTING** removed grime, grease and oil stains. A tent was erected around blast area to keep dust from interfering with traffic. One lane was worked at a time.



● **CLOSE-UP** view of the sandblasting operation, showing protection for the operator.



● **HALF** an hour after new wearing surface was laid, a sheet of polyethylene was placed over it for protection. This remained one day; road was opened in 3 to 4 days.

the mortar. Diethylene glycol, as a retarder, was added at the mixer. The mortar was transported to location in a two-wheel concrete buggy. A portion of the mortar was brushed thoroughly into the substrate with a street broom and an excess of mortar was maintained in front of the screed during the first pass. Two screeds were used, each bearing on the metal screed bar at one end and suspended from the top of the curb at the other end. Metal straps, to prevent wear, were attached to the bottom of the screeds which were shaped to conform to the crown of the road and permit one-half inch of new surfacing. The second screed followed about three feet behind the first. No further finishing of the surface was permitted as a thin film formed on the surface soon after the mortar was placed. To disturb this film might produce cracks in the thin wearing surface. This surface film also made it difficult to produce a smooth top on test cylinders.

Thirty-six 6-in. by 12-in. cylinders were made with the latex modified mortar, representing each of the mixes used in this project. The cylinders were covered with moist burlap the first night, following which both the burlap and the waxed molds were removed. The cylinders were shipped to the State Highway Testing Laboratory where they were stored at 50 percent relative humidity until tested in compression.

About one-half hour after a section of the wearing surface had been placed, it was covered with a sheet of polyethylene for one day only. Moisture which formed on the under side of this protective covering was all the curing that the wearing surface received. Approximately two hours after the mortar was placed, the cutting edge of a trowel was run along the edge of the screed strips to release them and to prevent spalling when they were removed later. Each lane was opened to traffic after the wearing surface had aged three or four days.

After the screed strips had been removed, the construction joints were cleaned out with an air blast and painted with epoxy resin. This material was mixed by hand in a 5-gallon pail using two parts D.E.R. 331 with one part Versamid 140. The mixed material had a working life of approximately one hour at normal temperatures, after which it was too hard to use. While the epoxy resin was still plastic, the joints were filled with bituminous cold patch material and compacted. The joints were then sealed with another coat of the epoxy resin and covered

with fine sand to produce a non-skid surface. Three sections of curb on the upstream side of the bridge at the easterly end were also painted with the same epoxy resin. This material was amber in color when mixed but turned quite dark when applied to the curb. It was applied when the air temperature was above 65°F and the contact surfaces were clean and dry. Under these conditions traffic was permitted to cross the finished joints in about four hours.

### Freeze-Thaw Cycles

The information given in Table 3 was obtained from Climatological Data, U. S. Department of Commerce. Damariscotta Mills is in approximately the same latitude as Dresden and about twelve miles from it. Assuming the temperatures at Dresden to be similar to those at this station the wearing surface on Middle Bridge received 94 cycles of freezing and thawing from November 1959 through April 1960.

There were approximately thirty-two snow or sleet storms amounting to one-half inch or more during the period from November 1959 to April 1960, inclusive. Both sodium chloride mixed with sand and clear sodium chloride used at the rate of 500 lbs. per mile were used for deicing purposes on the bridge soon

**Table 1—Results of Compressive Strength Tests on 6-inch by 12-inch Cylinders, Average of 3 Tests Each**

Panel No.	Latex Used	Age—days	
		28	90
		psi	psi
1	560	4059	6187
2	X-2144	5409	7393
3	X-2144	6994	9527
4	X-2144	6431	8677
5	560-25%	5252	7227
6	X-2144-75%		
	560	4781	6467

**Table 3—Freezing and Thawing Cycles and Average Temperatures at Damariscotta Mills, Maine**

Month	Number of Freeze-Thaw Cycles	Ave. Temp.
November 1959	13	39.3
December	13	29.6
January 1960	15	24.0
February	23	29.3
March	21	28.1
April	9	42.5
Total	94	

**Table 2—Itemized Project Costs**

Removed old concrete, asphalt, etc., from wearing surface	\$1,305.30
Sand-blasting	1,426.37
½" steel strips	83.41
Wood fillers	274.26
Cleaned wearing surface after sand-blasting	126.86
Placing ½" wearing surface	1,341.09
Cleaned joints and filled with cold patch and epoxy resin	59.12
Removed wood strips	18.41
Welded expansion plate	8.43
Cleaned material and equipment	15.79
Maintenance of traffic	115.57
Hauled concrete cylinders to Orono	21.33
Cleaning up	190.23
Total project cost	\$4,986.17
Unit cost per sq. yd. (based on 719 sq. yds. coverage)	\$6.93



● POURING epoxy resin on the bituminous cold patch material at a construction joint and spreading it with a brush.

after an appreciable accumulation of snow had fallen in each storm. The average daily traffic on the bridge was 720.

An inspection of Middle Bridge was made on August 3, 1960. Fourteen of the 22 repaired panels were found to be in excellent condition. The other eight panels contained a variable number of fine line cracks which probably penetrate to the depth of the thin latex modified mortar wearing surface. However, no cracks existed within 2½ ft. of the curb on either side of the bridge.

All of the panels containing Dow Latex 560 were in good condition. Six of the panels containing Latex X-2144 were in good condition, while four others showed a few cracks. All of the panels containing a mixture of Latex 560 with X-2144 showed a number of fine cracks, most of which followed the screed

marks transverse to the center line of the bridge. The longitudinal and transverse construction joints and the three sections of curb which had been painted with the epoxy resin were all in good condition.

During September 1959 the curbs on the Upper Bridge in Dresden were repaired with Dow Latex 560 as an admixture in Portland cement concrete. These were likewise in good condition eleven months later.

### Conclusions

Latex modified mortar provides good workability with a low water/cement ratio and permits resurfacing with a minimum one-half inch layer. Even thin latex mortar splashes adhered tenaciously to the face of the curbs.

Considerably better than average compressive strengths were obtained at the age of 28 and 90 days and the latex modified mortar wearing surface is expected to increase resistance to salt action. At the end of one year, the panels containing the Latex 560 were in slightly better condition than those containing Latex X-2144. The panels containing a combination of Latex 560 with X-2144 showed the greatest number of fine shrinkage cracks.

Appreciation is expressed to Richard B. Drubel and Jerry D. Peterson, Coatings Technical Service of the Dow Chemical Company, for technical assistance in the construction of the latex modified mortar wearing surface, and to the Dow Chemical Company for the latex and epoxy resin materials furnished for this project.

### Reference

Cardone, S. M.; Brown, M. G.; and Hill, A. A.; "Latex Modified Mortar in the Restoration of Bridge Structures." Highway Research Board, Washington, D. C., 1960.

# FINE GRIND Not Wanted!

New process for granulating sewage sludge for fertilizer reduces objectionable fines, gives more salable product

## C. E. KEEFER

Sewerage Engineer,  
Bureau of Sewers,  
Baltimore, Maryland

SINCE 1953, when the Back River Sewage Treatment Works, which serves the major part of Baltimore City and a large part of Baltimore County, was provided with facilities for heat drying the sludge, one of the problems associated with the operation of this project was the excessive amount of dust and finely divided particles in the dried product. Experiments conducted over a period of several months have indicated that this problem can be solved by compressing the sludge into thin sheets under high pressure in a compression mill, breaking the sheets into small fragments and passing these fragments through a granulating mill. This results in a product most of which will pass through a No. 6 sieve and be retained on a No. 24 sieve.

The heat drying plant where the vacuum filter sludge cake is dried consists of three flash dryers, each of which has an output of approximately 25 tons of dry sludge solids in 24 hrs., a 350-ft. stack and auxiliary equipment, which cost \$2,443,800. A mixture of three types of sludge is handled at the plant, consisting of sludge from the primary settling tank, activated sludge and humus tank sludge. The latter two are pumped into the raw sewage flowing to the primary settling tanks. The sludge from these tanks is pumped into 5 heated and 14 unheated digesters. Approximately 55 percent is primary sludge, 25 percent is activated sludge and 20 percent is humus tank sludge. The digested sludge is elutriated and then dewatered on four vacuum filters with an effective filtering area of 2,580 sq. ft.

Shortly after the drying plant was put in service, it was observed that the dried product contained an excessive amount of fine dusty material. Table 1 gives a sieve analysis of a typical sample of the dried sludge. Detailed studies were made to determine what had been done in other

cities to correct this difficulty. The sludge pelletizing equipment in Los Angeles, San Diego and San Francisco, Calif., was inspected and was found to be inadequate for the Baltimore situation. Several unsuccessful experiments were conducted at the Back River plant to solve this problem. One of the chief objections to the dust was the difficulty of getting men to work where the sludge was being handled. Several fertilizer companies refused to purchase the sludge, because their employees would not work around it. It was necessary to pay the men employed

at the sewage plant, who loaded the sludge on trucks and railroad cars, \$0.33 an hour more than they normally received as an inducement for them to work.

## Granulating Experiments

After many fruitless attempts had been made to find ways of granulating the sludge, Jack H. McLellan of Knowles Associates, collaborating with H. J. Baker and Brother, Inc., conceived the idea that the material might be pressed into a sheet and then granulated.\* Small scale experiments conducted at the plant of the Allis-Chalmers Manufacturing Company gave considerable promise of success. A compacting mill was

\*A patent has been applied for covering this method of processing.



● COMPACTOR mill for compressing finely divided heat-dried sludge into sheets which are then granulated. Result is a product that is easier to handle and to sell.

rented from this company with the understanding that the mill would be purchased if the experiments were successful. Additional equipment, consisting of a granulator and a set of vibrating screens, was purchased and erected on the furnace room floor of the heat drying building at the Back River plant, and the tests were begun in February, 1959.

The compacting mill consisted of two heavy steel cylinders, each 18 in. in diameter and 16 in. long, set parallel with each other in the same horizontal plane. The cylinders were rotated, one clockwise and the other counterclockwise, each at a speed that could be varied from one or two to 30 rpm by a 7½-hp. motor. As the finely divided sludge, which was to be processed, was fed from above, it was heated by three 375-watt infrared reflector lamps and was subjected to the action of a plate magnet to remove any ferric metals present. The sludge then fell through the space between the two compression cylinders, which was maintained at 0.055 in. The sludge was compressed under a pressure of 150,000 psi into a thin sheet. The sheet was broken into fragments a few inches square as it fell into a shallow pan beneath the compacting mill. Early during the experimental work, it was observed that heating the sludge by the above-mentioned infrared reflector lamps was responsible for making the sludge flakes soft and pliable instead of brittle; so the use of the lamps was discontinued.

**Table 1—Siege Analysis of Heat Dried Sludge**

Sieve Number	Before Compacting and Granulating (Percent)	After Compacting and Granulating (Percent Passing)
4	100.0	100.0
8	100.0	99.7
16	98.5	56.4
30	89.7	11.5
50	68.4	4.7
100	42.7	3.4
200	16.2	0.0

The consistency of the sludge fragments varied to some extent and depended on the amount of grease in the sludge. When the grease content (dry solids bases) was under 8 to 10 percent, the fragments were brittle and firm; however, when the grease content was greater than 12 to 14 percent, the cake fragments were soft and pliable. At first, the fragments of sludge were fed by hand into a granulating mill, equipped with two rolls, each of which was 9 in. in diameter by 6 in. long. Each roll was provided with 14 longitudinal corrugations per inch. The clear space between the rolls was adjustable so that the size of the granulated particles of sludge passing between the rolls could be varied. A double deck vibratory screen, which could be provided with screens of different sizes of openings, was used to segregate the undersize and oversize particles.

From the beginning of the experiments, it was observed that the compacting mill was capable of successfully compressing the sludge in sheets with a thickness varying from about 0.08 to 0.01 in. It was thought that perhaps inorganic materials in the sludge would erode the surfaces of the two compression rolls. Such, however, was found not to be the case.

From the very beginning of the investigation the small 9 by 4-in. granulating mill failed to operate satisfactorily. The difficulty was that sludge accumulated in the corrugations of the rolls, and after a very short period of operation the granulator had to be shut down to clean the rolls. This granulating mill was discarded and replaced by a Sprout Waldron mill, equipped with three pairs of 9 by 30-in. chilled rolls, one above the other. The top rolls had eight saw-tooth cuts per inch. The cuts were on a spiral of 2½ in. per ft. The speed ratio of the rolls was 2½ to 1. The middle and the bottom pairs of rolls were the same as the top rolls except that they had 12 and 16 cuts per inch, respectively.

#### Results of Tests

Over 40 tests were made, 18 of which are reported in Table 2, to see if the roll mill could satisfactorily granulate the compressed sludge flakes and to determine the percentages of suitable product, oversize particles and fine material in the discharge from the machine. It was

**Table 2—Operation of Sludge Granulator**

Test No.	Clearance between granulator rolls			Analysis of sludge			Granulator discharge			Remarks
	Top rolls in.	Middle rolls in.	Bottom rolls in.	H <sub>2</sub> O %	Grease, dry solids basis %	Thickness of sludge flakes to granulator in.	Oversize %	Fines %	Acceptable product %	
1	0.040	0.040	0.050	7.1	7.14	0.085	1.0	61.8	37.2	In tests 1 through 10, oversize material retained on 8-mesh screen; product retained on 24-mesh screen and fines passed through screen.
2	0.070	0.070	open	7.1	7.60	0.083	40.0	29.6	30.4	
3	0.060	0.060	open	7.1	7.60	0.084	7.8	46.1	46.1	
4	0.065	0.065	0.080	7.1	7.60	0.080	17.6	40.4	42.0	
5	0.065	open	open	8.2	12.08	0.096	62.0	17.0	21.0	
6	0.055	open	open	8.2	12.08	0.090	62.2	15.0	21.8	
7	0.055	open	open	8.2	11.04	0.080	58.0	14.7	27.3	
8	0.050	0.050	open	8.2	11.00	0.080	35.7	22.8	42.5	
9	0.050	0.050	open	6.4	11.44	0.080	29.2	32.6	38.2	
10	0.050	0.050	open	6.4	11.44	0.083	17.3	38.4	44.3	
11	0.050	0.050	open	6.4	10.70	0.088	21.3	30.2	48.5	In tests 11 through 18, oversize material retained on 6-mesh screen; product retained on 24-mesh screen and fines passed through screen.
12	0.050	0.050	open	6.4	10.70	0.086	26.5	27.8	45.7	
13	0.050	0.050	open	—	12.80	0.088	9.4	30.5	60.1	
14	0.050	0.050	open	11.8	14.30	0.086	8.0	40.0	52.0	
15	0.050	0.050	open	11.8	14.30	0.102	5.5	33.2	61.3	
16	0.050	0.050	open	—	13.20	0.086	5.9	31.6	62.5	
17	0.050	0.050	open	—	10.04	0.085	5.3	32.2	62.5	
18	0.050	0.050	open	—	7.45	0.086	6.4	33.5	60.1	

recognized that there were a number of variables that would affect the capacity of the mill and its operation. These were the clearance between the granulator rolls, the number of rolls that were operated and the grease and water content of the sludge flakes.

Tests were made when operating the top, the top and the middle and all three sets of rolls. When only the top set of rolls was operated (Tests 5, 6 and 7), the amount of oversize particles passing through the granulator varied from 58.0 to 62.2 percent and was excessive. On the other hand when all three rolls were operated, as indicated by Test 1, the oversize particles amounted to only 1.0 percent but the amount of fine particles in the granulated product was excessive, amounting to 61.8 percent. When only the top and the middle rolls were used and were adjusted to have a clearance of 0.05 in., satisfactory results were obtained.

Before the tests using the Sprout Waldron mill were begun, it was felt that the grease content of the sludge flakes being processed by the granulator would play an important role in its successful operation. Sludge with a high grease content was, therefore, purposely processed by the granulating mill. Tests 5 to 17, inclusive, indicate that the grease content on the dry solids basis in the sludge varied from 10.04 to 14.3 percent. Raw sludge, which contained 14.3 percent grease (Tests 14 and 15), was drawn direct from the primary settling tanks, was heat dried, compacted into sludge flakes and then granulated.

After each test, which lasted about an hour, a careful examination was made of the granulating rolls. There was no significant accumulation in the roll corrugations. At no time were the rolls cleaned, and no brushes were fitted to the rolls as is generally the practice with commercial granulator mills.

Two sets of screens were used to segregate the oversize and fine materials from the product, which contained the desired particle sizes. During Tests 1 to 10, inclusive, 8 and 24-mesh screens were used, and during Tests 11 to 18, inclusive, 6 and 24-mesh screens were used. When the 8-mesh screen was used, the percentage of oversize particles was excessive. For example, during Tests 8, 9 and 10 the amount of oversize particles varied from 17.3 to 35.7

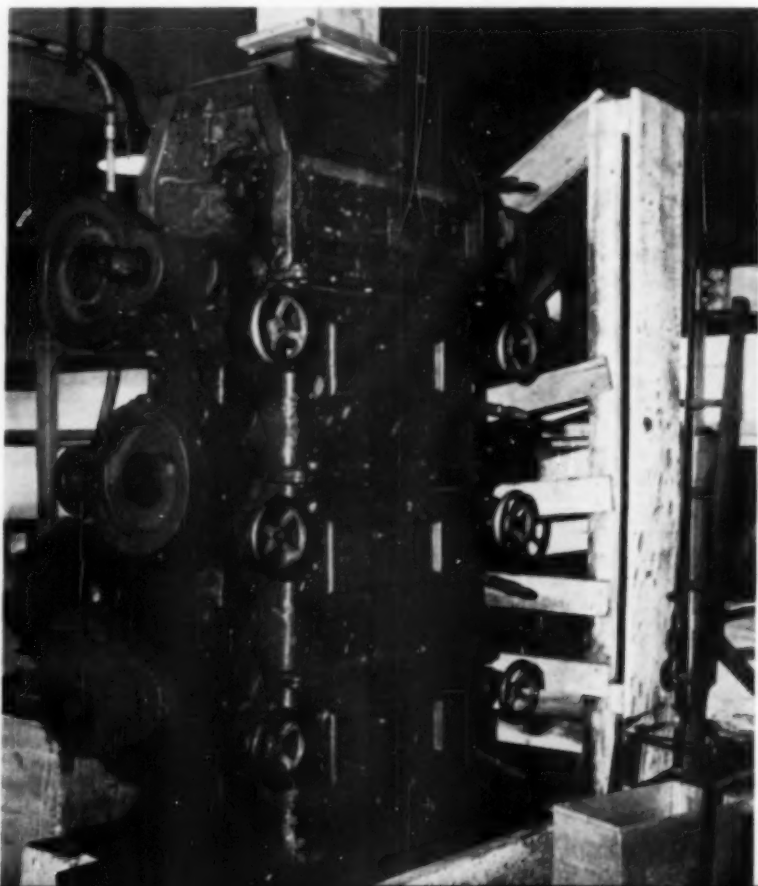
percent. If 8-mesh screens were used, a considerable percentage of the material would have to be recycled back through the granulator. When a 6-mesh screen was substituted for the 8-mesh screen, the amount of oversize particles was reduced to 5-10 percent and the percentage of acceptable product was correspondingly increased. Tests 13 to 18, inclusive, indicate that approximately 60 percent of the granulator mill output will be a satisfactory size, 5 to 10 percent will be oversize and 30 to 35 percent will be undersize when 6 and 24-mesh screens are used. Table 1 gives a sieve analysis of a sample of the compacted and granulated product that passed through a 6-mesh screen and was retained on a 24-mesh screen. It is interesting to note that whereas 68.4 percent of the unprocessed sludge passed through a No. 50 sieve, only 4.7 percent of the processed sludge passed through this sieve.

The tests indicated that the digested sludge, which was heat dried in flash driers at the Baltimore plant and which had a grease content on the dry solids basis varying from about 7 to 14 percent, could be satisfactorily compressed into thin sheets and then granulated. Consequently,

plans are being prepared to install the compacting mill permanently at the sludge drying plant together with a granulating mill, vibrating screens and the necessary sludge conveying equipment. The oversize particles will be recycled back through the granulator and the fine particles will be added to the heat-dried sludge being processed in the compacting mill. Since this mill has a rated capacity of 2.5 tons an hour when operating at a speed of 30 rpm, all of the other equipment will be designed to handle this quantity of material. It is believed that these improvements will produce a product that will be easier to handle, will be more acceptable to fertilizer companies and will command a higher price. It is estimated that the sludge compacting and granulating equipment including the necessary building to house these facilities will cost \$210,000.

#### Acknowledgments

The sewage plant is under the general direction of Bernard L. Werner, Director of Public Works, to which Dr. Abel Wolman is consultant. R. J. Trautman, Principal Engineer, has general supervision over the plant and P. L. Smith is Superintendent.



● MILL used for granulating fragmented sheets of heat-dried sludge at the Back River Treatment Plant.

# CONTROLLED TEST OF REINFORCED ASPHALT

ONE OF the first completely controlled experimental field installations of reinforced asphaltic concrete highway resurfacing was completed this summer by New York State. The project was the improvement of a mile and a half stretch of U. S. Route 44, east of Poughkeepsie between Washington Hollow and Millbrook Village, Dutchess County, in Highway District 8.

Although the existing Portland cement concrete pavement was generally in passable condition, several of its 40-ft. long slabs had one or more fairly severe transverse cracks or corner cracks. This condition, considered with the need for widening the old 18 to 20-ft. wide pavement to the present 24 ft. standard, influenced District 8 Engineer Kurt G. Rauer and his staff to make a test installation of wire-fabric reinforced asphaltic-concrete resurfacing.

Mr. Rauer felt that the placement of welded wire fabric in the asphalt mix over the joints between old pavement and widening sections, and over the transverse joints and cracks would be an effective try-out of the fabric's ability to reduce reflection cracking in the new surfacing, long a bug-a-boo in this type of construction. The control and competitive testing established by the engineers consisted of the deliberate omission of the steel fabric from certain complete sections of the mile and a half length, and from over some transverse cracks.

To assure accurate test results in future years, a careful slab-by-slab crack survey was made and plotted, with actual location of all breaks in the pavement pinned down to the inch by reference to station markers along the right of way. This survey also shows exactly where the steel fabric was placed, and where omitted.

As a further check on the results in future years, the Bureau of Physical Research of the New York Department of Public Works made one of the first major uses anywhere of a new continuous strip photographic process, by which was recorded pictorially every inch of the

mile and a half long stretch before the work started. It is anticipated that a similar photographic record will be taken in several years, and a side-by-side comparison made in order to check the steel fabric's effectiveness in reducing cracks.

Construction of the \$148,312 contract was done by Callanan Road

Improvement Company and Superintendent George Williams decided to extend the trailing ends of the sled and rails completely under the conveyor screw, in order to eliminate catching of the wire fabric.

This alteration was done overnight, and the next day, (first day



● PAVES 15 laying 1½-in. course of asphaltic concrete over welded wire reinforcing. Hot mix in front of paver helps reduce slippage of paver tracks on the fabric.

Improvement Company (AGC), South Bethlehem, N.Y. Although this was the contractor's first experience with fabric-in-asphalt construction, the job was done with only the minor hitches attendant on unfamiliar procedures. Satisfactory mix tonnages of well over 500 tons were racked up after the first day.

The principal problem the contractor had to solve was proper adjustment of the rails and sled which ride outside of and between the paver's cat tracks and iron out the steel fabric, keep it down in the asphalt mix, and prevent the fabric from becoming entangled in the paver's distribution screw. After a short test run of a few slab lengths the day before major construction started, W. C. LaRow of the Cal-

lan Road Improvement Company and Superintendent George Williams decided to extend the trailing ends of the sled and rails completely under the conveyor screw, in order to eliminate catching of the wire fabric. This alteration was done overnight, and the next day, (first day

of full scale work) the paver rode over the steel mesh and placed a normal tonnage of hot mix. That the contractor was able to pave a 1½-in. thick course of asphaltic concrete over wire fabric with only minor delays is attributed to careful workmanship and close supervision. Based on the experience of previous fabric-in-asphalt jobs, this thickness is slightly less than the 1¾-in. minimum thickness (compacted) in which fabric has been readily placed.



● WORKERS position sled at start of day's work. Sled will be towed under the paver to flatten down wire fabric, prevent it from tangling in the conveyor screw.

may be pre-selected from 11 to 189 feet per minute, with the paver moving to the selected speed by the flick of a switch at the operator's console. But, because an abrupt rise to paving speed might cause the tracks to slip over the steel fabric, Superintendent Williams designed and built into the paver a gasoline decelerator. This was simply a spring-tensioned, pedal-controlled throttle in the gas line which, when pressed down by the paver operator, decelerated the engine to idling speed. When the operator started up, he first threw the micro-switch to engage the clutch, and then eased his foot off the decelerator, and let the tracks gradually rise to the pre-selected speed. As a further precaution against slipping, the contractor scattered small quantities of hot mix over the steel fabric out in front of the tracks.

Callanan Road Improvement Company's contract included not only the resurfacing but also placement of some drainage pipe and widening of the highway, in either two 3-ft. sections or one 4-ft. section. The widening consisted of a foot thickness of gravel, topped by 6 ins. of plant mix asphalt (45 SY). Stabilized shoulders were built up to the edge of the new pavement and spread out to the new ditch line.

The resurfacing operations were accomplished in this sequence: First, an evener course of asphaltic concrete averaging 1 1/2 ins. in thickness at selected locations; next, the binder course (including the 3x6-10/10 welded wire fabric) of type

1A asphaltic concrete with a maximum size stone of 3/4 in.; finally, a 1-in. thick top or wearing course of type 1A with a maximum size stone of 1/2 in. Compaction was done by two Buffalo-Springfield rollers of 10 and 12 ton capacity.

All the sheets of fabric for reinforcement of the resurfacing were delivered to the site in 13-ft. lengths in widths of 5, 7 1/2 and 8 ft. The 5-ft. wide sheets were used over the

longitudinal joints, the 8-ft. widths over the transverse joints and cracks, and for full width reinforcing of the 24-ft. wide highway, two 8-ft. wide sheets and one 7 1/2-ft. wide sheet were butted, allowing 3 ins. clearance on each side.

Although in positioning the fabric sheets the usual practice has been to place in an up position, the wires parallel to the axis of the pavement in order to ease passage of the paver over them, on this job no trouble occurred when the transverse wires were sometimes faced up in order to make the sheets lie flat.

Where necessary, for example when the paver was about to move up onto a first sheet of wire fabric in a reinforced section, the edge of the sheet nearest the paver was secured with concrete nails to the underlying evener course of asphaltic concrete.

Hot mix for the project came from Dutchess Quarry and Supply Company, Pleasant Valley, N. Y., and totaled over six thousand tons. The project was completed by the contractor in 14 days. Project engineer for the state was David P. McCoy. Assistant district engineer is M. N. Sinacori. The only previous reinforced asphalt jobs in New York state were in the Rochester and Buffalo districts several years ago. First installation of fabric in asphalt in this country was made near Beaumont, Texas in 1945.



● FINAL adjustment of the towing chain for one of the rails which ride outside of the paver's treads. These rails, together with the sled, "iron out" the fabric.

# SEWERING IN SOLID STONE

**T. A. KLINGER**  
City Sanitary Engineer,  
Marion, Ohio

**W**HENEVER a municipality needs to expand its sanitary sewer system, certain problems arise. Beyond the initial problem of convincing the public that a need exists, legislative authority must be sought, financing must be arranged, plans must be prepared, bids taken and finally, construction must begin.

The responsibility of the City Sanitary Engineer's office in Marion actually extends through all these phases. We are among the first to know of the need. It is then our job to prepare plans which will solve the problem and present them to the council. After approval, the taking of bids and awarding the contract, we coordinate and supervise the actual construction.

It is always our hope that the locale for the construction will present conditions which will allow for easy trenching and pipe laying. In Marion, however, we are seldom that fortunate.

When our Biblical forefathers said, "build thy house on solid rock," they must have had our city in mind because Marion is, for the most part, built over deep sub-layers of solid limestone. Magnifying the problem is the relatively flat topography, making either deep cuts through the



● **SOLID limestone made it necessary to sink shafts to the level of the sewer and to connect these by tunnels. This is a 21-in. VC pipe installed in a tunnel.**

rock or the use of lift stations necessary.

Such was our problem recently when the City Administrator and the city council gave us the go ahead on constructing relief sewers along Silver Street and Davis Street. In the Silver Street section, surveys showed we would encounter the solid limestone sub-layers. Conversely, on the Davis section we were to encounter clay and quicksand. Both, of course, called for unusual construction techniques.

## **Silver Street Relief Sewer**

We knew from past experience that the ordinary method of digging

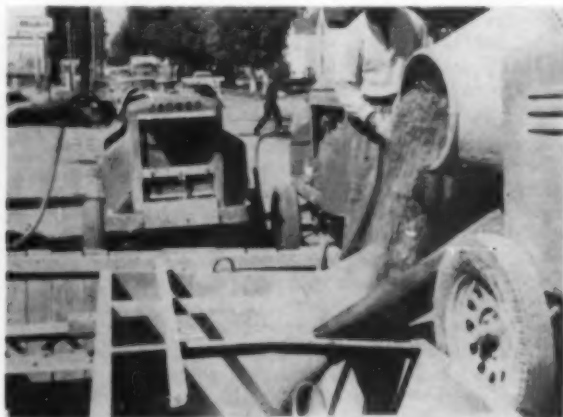
a continuous open trench through the limestone sub-layers would entail costs and problems which our city could not bear. It also would have meant that a great deal of blasting would be necessary. Because of the close proximity to houses adjoining the street, we knew the residents would be up in arms if this method were used.

It was decided that the only feasible method of getting the pipe down to the desired level was to sink shafts at intervals along the street and to connect them with tunnels. The shafts were sunk to an average depth of 12 ft., and the project was under way. The work was further complicated because our tunnels had to be cut under both the Pennsylvania and the Chesapeake & Ohio railroad tracks which crossed the street at grade level. This meant getting approval from the railroads, one of which chose to put an inspector on the job while tunneling was in process.

Extra strength vitrified clay pipe with factory-made compression type joints (conforming to ASTM Specification C425 type 3) was selected for the work because of the speed and ease of jointing and because we believed its durability and tight joints would avoid premature replacement. Sections of the pipe, particularly where it ran beneath the railroad track, would be most difficult to replace.



● **FACTORY-made compression type joints permitted workmen to install gasket on spigot end in the manner shown here.**



● **WHERE sewer passed under railroads, dry-mix concrete was used for backfill, providing concrete encasement for pipe.**

To connect the shafts, a tunnel about 3 feet in diameter was cut through by the use of pneumatic tools and, where necessary, dynamite. This gave the workmen sufficient room to handle and install the 21-inch diameter clay pipe. The compression joints made it possible to work from the ends of the pipe lengths and to push the sections together without the men having to straddle or work around them.

Since some of the shafts were more than a hundred feet apart, a means had to be devised to convey the pipe sections through the tunnel. To accomplish this, C. C. Plumley Contractors of Marion, who held this contract, laid narrow-gauge track on the tunnel bed and converted a garage type hydraulic automobile jack into a "dolly" by fitting it with wheels to run along the track. The pipe sections were placed on the "dolly" and run into the tunnel to the desired location. The "dolly" bed, by means of the jacking mechanism, could be raised to the desired level, the pipe slid off and directed into the adjoining section. Fill was then tamped under the pipe.

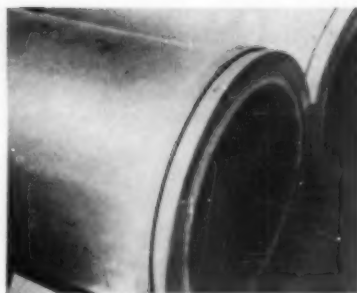
Even under the most difficult conditions, the compression joints enabled the laying of an average of 180 feet of pipe in the tunnels in an 8-hour day with a minimum crew. This speed was also an important safety factor because the workmen spent a great deal less time in the tunnel.

In all, 2,760 feet of 21-inch vitrified clay pipe was laid in the Silver Street section. Total installation costs averaged \$70 a foot in the tunnel. Where it crossed under the railroad tracks, there were additional costs to counteract impact loads which might be exerted on the pipe. Additional care was also taken in compaction to eliminate the danger of settling which might affect the track grade.

#### Davis Street Relief Sewer

Whereas on Silver Street our problem was breaking through stone sub-surfaces, less than a mile away on the Davis Street Relief Sewer just the opposite was encountered—clay and quicksand. Here, due to the danger of cave-ins of the open trench, proper shoring was mandatory. On this section 3,825 feet of 10 and 12-in. vitrified clay pipe was installed. Again, compression type joints were used to insure tight connections and to cut worker time in the trench.

The pipe was laid on plank floats which were weighted and sunk to



● CLOSE-UP view of the factory-made compression-type joints. These consisted of polyester truing rings molded onto both the spigot and the bell of the pipe.

grade, and then the trench was backfilled with No. 46 crushed stone. Because of infiltrating ground moisture, the crushed stone solidifies and forms a stable trench bottom. Storer Construction Company,

Toledo, Ohio, was the contractor on this section.

Work on both sections proceeded according to schedule, and the new system of relief sewers has provided our city with the much needed extra capacity to carry us through the growing pains which are the natural result of a mushrooming population. The successful completion of the project is a tribute to the cooperation between the citizens, the city officials and the people actually involved in the construction.

## Converted Mower Cleans Expansion Joints

FRED E. HARDY

Director of Public Works,  
Zanesville, Ohio

THE TASK of cleaning expansion joints in concrete pavements and for cleaning cracks in any type of surface prior to sealing operations has been solved for the Zanesville, Ohio, Street Department by the construction of a special joint and crack cleaning attachment for a self propelled mower. The accompanying picture shows Dale McCoid, Street Department maintenance employee, receiving operating instructions from Gerald Lloyd, right, who developed the crack cleaning attachment for a Gravely rotary mower. Mr. Lloyd is Superintendent of Woodlawn Cemetery in Zanesville.



● WIRE brush to clean cracks and expansion joints is attached to mower.

Basically the machine is a standard dual tired, gasoline engine driven, rotary mowing machine. Employing the driving arm attachment used to operate reel type mowing cutters, Mr. Lloyd put together a chain driven axle in the enclosed housing to turn a 16-inch diameter wire brush. The wire brush, which is a heavy duty type used by foundries to clean castings, can be raised or lowered manually to achieve any depth necessary for cleaning a pavement joint or crack. The housing cover protects the chain drive and bearing from dust and foreign objects. The chain drive is oiled through a small pipe on top of the cover.

After brushing, an expansion joint or pavement crack is usually cleaned out by compressed air, though this is not entirely necessary when using the high speed wire brush. Also it has been found that by using a smaller diameter wire brush on each side of the 16-inch diameter main brush, the necessity for compressed air cleaning is practically eliminated.

Where the wire brush will not dislodge foreign material in a joint, a steel gouge attachment is provided to clean the joint, using the pushing power of the self propelled mower. The gouge is shown attached to the frame of the machine to the right of the wire brush; it uses an arm made from three-inch wide steel channel.

The wire brush cleaning attachment and gouge arm can be quickly removed and rotary mowing blades replaced to equip the Gravely unit for regular mowing duties in the cemeteries and parks.

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# GEORGIA GUMBO

## ... A CHALLENGE to CONTRACTORS

**G**EORGIA GUMBO, on every contractor's "Not Wanted" list, ranks near the top of the most infamous types of dirt to handle. In a cut, the scarlet-colored mixture of clay and sand invariably comes up in huge, jagged chunks, even when it has good moisture content for loading. It makes short run cuts impractical, capacity scraper loads near impossible, and spreading difficult.

But a Macon, Georgia, contractor, R. A. Bowen, Inc., has been moving

grader. The required 100 percent compaction was achieved using a crawler tractor and grid roller ballasted with concrete blocks. A rubber-tired tractor and tandem sheepsfoot roller were also used. A Model 45 motor grader put the finishing touches on back-slopes and maintained the haul road so that scrapers averaged cycle time of about 4.5 minutes. Just south of the overhead bridge site, an HD-16 dozed in material to be used for backfilling over a 250-foot length of

ments with spring after an unusually severe winter had halted construction.

So far as the State of Georgia is concerned, 1,107 miles of Interstate highways are proposed. Of the total, 84 miles are now completed, ranking the state second in the southeast and 18th in the nation in the number of Interstate projects completed and under construction. Another 134 miles are under construction and will be open to traffic by the end of 1961. Cost of the sys-



● TRENCH for 30-inch concrete drainage pipe was dug by Bucyrus-Erie dragline, right, and backfilled by an HD-16.



● ONE OF the six motor scrapers gets a heaped load despite nature of soil. Job involved moving 1.4 million cu. yds.

the red stuff for 30 years. He started last summer to move another 1.4 million yards, this time on a 10.7-mile stretch of Interstate Highway 75 near Cordele in Crisp County. The company has an \$800,000 earth-moving contract.

Joel Hicks, Bowen's job superintendent, estimated that about 210,000 cu. yds. had been moved during the first month—a rather slow start due to weather and getting a new job rolling. Six new Allis-Chalmers TS-360 motor scrapers are being used. For the most part, they are being tandem pushed by HD-21's. Loads are averaging about 25 yards in 45 seconds. Spoil from one 21-foot cut was hauled about 1,200 feet and used to build an access road that will pass over I-75. Here, TS-360's spread six to eight inch lifts in about 15 seconds.

Leveling was done by a motor

30-inch concrete drainage pipe. The trench had been dug by a Bucyrus-Erie Model 22-B dragline. The unit also placed the pipe, manufactured in Macon by the Bibb Concrete Pipe Co.

Also under separate contract is the construction of eight sets of twin concrete bridges. There are two interchanges on the Bowen job. Both are just east of Cordele, about a mile apart. One will handle traffic at State Route 257; the other at the intersection of I-75 and U.S. 280 (State Route 30). Bowen's 10.7-mile segment is part of an 118-mile leg from the Dooley-Houston county line south to the Florida state line where a major portion of construction on Georgia's Interstate System is concentrated. Several sections are in the process of being paved, while land clearing and grading commenced on other seg-

tem in Georgia is estimated by highway department officials at \$1 billion. Thus far, 39 prime contracts have been awarded, totalling \$83 million. Another \$30 million has been spent for right-of-way acquisition and \$8 million for engineering and related expenses.

Currently, the big push in Georgia is on Interstate 75, which roughly parallels the well-traveled U. S. 41 from Chattanooga, Tenn., through Atlanta and Macon to Valdosta, near the Florida state line, a distance of 358 miles. A three-mile stretch of I-75 near Forsyth in Monroe county has already been completed; another 21 miles of I-75 and I-85 that are part of the Atlanta expressway system are open; 37 miles in Tift and Turner counties and twenty-three miles of Interstate 85 northeast of Atlanta are also completed.



## 5 Ways to increase production, cut your materials-handling costs with **CASE** loaders

### **SPEED WORK CYCLES**

Balanced power-to-weight ratio ... exactly the right combination of engine power, traction and machine weight; for faster digging, less wheel slippage.

### **SIMPLIFY OPERATION**

Balanced weight distribution over 55% of empty weight on rear wheels, provides greater ground-gripping traction. No bucking or raising rear wheels off ground. This, combined with torque-converter drive and powerful breakout, gets big loads fast. Convenient shuttle-shift and speed range controls give operator efficient one-handed control of direction and operating speeds.

### **EXTEND LOADER LIFE**

Case balanced construction results in less strain on engine, transmission, less wear on tires. All-welded channel subframe, heavy steel axles and cross-braced box-welded loader assembly provide maximum strength and rigidity.

### **CUT DOWNTIME**

Brake, electrical and steering systems are all easily accessible by merely removing front cover plate. Case-built engine has multiple cylinder heads and removable wet-type sleeves to permit servicing without pulling engine.

### **INCREASE SAFETY**

Note that loader arms are pivoted ahead of operator. This exclusive feature gives unequalled visibility plus maximum operator safety. Better weight distribution, low center of gravity and wide-tread stability mean greater safety and permits moving bigger loads at higher speeds ... less bouncing.

*Remember, with all their advanced features, Case loaders are economically priced. That's because Case-built diesel engine and all other components and assemblies are covered by one warranty, one service source. There's no split responsibility.*

C-TL-536

## Choose from three diesel powered models

### **5500-lb. carry capacity**

**W-9** handling 1¼, 1½ or 2½-cu. yd. buckets. Lifts 11,000 lbs., delivers up to 13,500 lbs. breakout force. Also available with gasoline engine.

### **6500-lb. carry capacity**

**W-10** handling 1¼, 2 or 2½-cu. yd. buckets. Lifts 13,000 lbs., delivers up to 17,000 lbs. breakout force.

### **9000-lb. carry capacity**

**W-12** handling 1½, 2½ or 3½-cu. yd. buckets. Lifts 15,000 lbs., delivers up to 23,500 lbs. breakout force.

## All with:

- 4-wheel drive
- Power-transfer differentials that automatically deliver 25% more power to wheels on firmest footing.
- Torque converter that instantly, automatically provides up to 3 times the push-power to meet load or footing conditions.
- Power shift
- Power steering
- Choice of optional attachments such as pallet or block forks, bulldozer blades, brush stackers and snow removal units that are interchangeable with the loader bucket.

# **CASE®**

J. I. CASE CO., DEPT. M1340

RACINE, WIS.



## NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

### APWA Puts On Drive For Public Agency Membership

In an effort to acquaint more cities across the nation with the advantages of Public Agency membership in the American Public Works Association, the Association's President, Frederick W. Crane, General Manager, Buffalo Sewer Authority, Buffalo, New York, has sent letters to the mayors of all cities with a population of over 5,000. The campaign was launched early in November.

A total of approximately 200 municipalities are currently enrolled as Public Agency members. Detroit, Cleveland, Denver, Omaha and Winston-Salem are among those recently joining. Each Public Agency may designate representatives to serve as active members in the Association in accordance with a uniform schedule established by the Board of Directors. In his letter, Crane pointed out some of the reasons why cities should consider this type of membership and the services it affords.

Membership in the Association has been growing very rapidly over the past few years. Total membership now stands at over 5,000, with a net gain of over 550 within the past year. This membership includes directors and assistant directors of public works, city engineers, street superintendents, highway engineers, mayors and city managers, utility officials, consulting engineers, professors, editors, and commercial organizations.

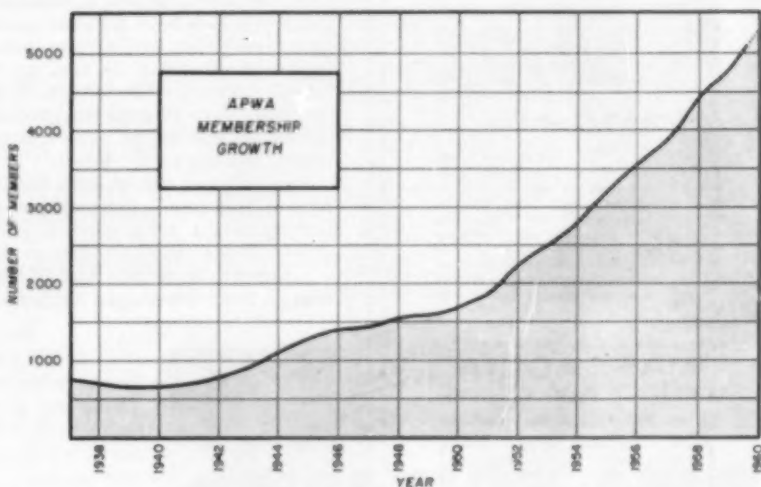
Public works officials are asked to encourage mayors to act favorably upon this letter by President Crane. For further information about Public Agency membership or other membership in the Association, please write to the Headquarters office, The American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois.

### New Officers Elected at Michigan Chapter Meeting

The Michigan Chapter of the APWA saw one of the largest turnouts ever experienced at a monthly meeting with 73 in attendance at the October 6th meeting in Detroit. Glenn C. Richards, commissioner, department of public works, De-

troit, was guest speaker and honored as one of the recipients of the Top Ten Public Works Men-of-the-Year Award. Kiwanis International presented to Richards a bronze plaque prepared for the occasion by the APWA.

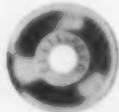
Newly elected chapter officers include: George L. Nampa, city engineer and director of public works, Royal Oaks, president; Howard L. Lilley, city engineer, Dearborn, 1st vice-president; Richard L. Castle, chief engineer, Oakland County Department of Public Works, 2nd vice-president; Clyde Palmer, assistant city engineer, Detroit, 3rd vice-president; and Frederick A. Mammel, superintendent of public works, Ann Arbor, secretary-treasurer.



**OFFICERS:** Frederick W. Crane, Buffalo, N. Y., President; Albert G. Wyler, New Orleans, La., Vice President. **REGIONAL DIRECTORS:** (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Marin, Oakland, Calif.; Roy W. Morse, Seattle, Wash.; (term ending 1962) Paul R. Screvane, New York, N. Y.; Manon P. Phillips, Augusta, Ga.; Edward J. Booth, Bismarck, N. D.; (term ending 1963) George J. Maher, Lewiston, Maine; Robert S. Hopson, Richmond, Va.; Harlan H. Hester, Fort Worth, Texas. **Immediate Past President,** Jean L. Vincenz, San Diego, California. **Robert D. Bugher, Executive Director.**



## Ellis Heavy Duty Pipe Cutters For Pipe Up To 16" Dia.



With Long  
Lasting Cutter Wheels

Designed for water works men who appreciate the rugged construction of drop-forged frame and links; and a tool that assures no pipe breakage, no re-cutting and no spoilage.

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- PITTSBURGH, PA. Hotel Sherway
- CINCINNATI, O. Hotel Clinton
- HONOLULU Hotel Waialae

World-famed hotels  
Teletype service—Family Plan

## The 1960 Yearbook is Off The Press

The 1960 edition of the American Public Works Association's Yearbook is off the press and is now being mailed to Association members. With a handsome emerald green and white cover this year's publication is packed with information of a technical nature as well as data about the Association and its membership.

As in the past, the Yearbook con-

tains the proceedings of the Annual Congress (held this year in New York City), an alphabetical and geographical listing of members and of officers and committees, the constitution and rules governing local chapters, and a section devoted to professional announcements and commercial advertisements.

All of the technical papers presented at the New York Congress are reproduced in full. Among them are: "Gains and Gaps in Water Pollution," "Transportation—The

## The Contractor's Place in APWA

There is no doubt that the contractor has a definite place in the APWA. The personal contacts are, of themselves, very valuable to both public officials and the contractor. They become acquainted with each other, can discuss mutual problems and come to a better understanding of these problems. They learn to like and respect each other and can understand the importance of each other's position in their community.

The APWA gives the contractor the opportunity to present his own ideas and suggestions to public officials in a setting that is sympathetic and receptive. It also gives him an insight and a chance to learn more about procedures, specifications and requirements, with their intent, which I know through my experience can be very valuable in bidding or fulfilling a public contract. There is a close relationship existing between public works contractors and public works officials, and this close relationship has been engendered through the personal contacts that are afforded by their membership in the APWA.

Team work and the mutual understanding between them invariably saves tax dollars. The public works official is always concerned about saving these tax dollars and has learned that through the cooperation with the Associated General Contractors or other similar contractor organizations and with equipment dealers and manufacturers, these fine objectives can be obtained. I know that many AGC members throughout the United States belong to the APWA and derive a great deal from this Association.

In the County of Los Angeles, we have some 60 incorporated cities, many of which have different specifications. The APWA Utility members, both public and private, together with the contractors and public works officials in the area got together and recommended a Model Street Excavation Ordinance, and I am happy to say that many of the cities have adopted the standards of this Model Ordinance, eliminating, as you might expect, a great many headaches for the contractor and the utility where a pipe extended through different cities.

We now have a local Joint Committee of the APWA-AGC, which is working on standard specifications for street paving, curbs, gutters and sidewalks. I am sure its efforts will be rewarded by having a great many of the awarding authorities accept its recommendations.

I would like to add that I sincerely appreciate and will always cherish the friendships I have made through my APWA Membership.

J. A. Thompson



J. A. Thompson is an Engineering Contractor in Los Angeles. He heads his own company, J. A. Thompson & Son, Inc. He is President of the Southern California Chapter of the APWA, a member of the National Board of Directors of the AGC, past president of the Southern California chapter of the AGC, member of the Board of Direction of the Consulting Constructors Council of America, a director of the Los Angeles Metropolitan Traffic Association, and has served as a member of the Little Hoover Commission and is a member of the Board of Water & Power Commissioners for the City of Los Angeles.



## DIG TRENCH AND BELLHOLES IN SINGLE PASS

**The Cleveland JS-30 Trencher  
digs bellholes at pipe joints,  
digs flush to obstructions,  
slopes as it digs.**

Note the ample-width bellhole in the foreground above. The JS-30's exclusive power-shifted digging wheel shifts  $2\frac{1}{2}$  feet to each side of center to dig bell-holes like this and to keep trench in line even when crawlers are being steered around side obstructions.

The JS-30's wheel power-*tilts*, too—saves blocking and cribbing when either crawler track is higher than the other on curbs, side slopes, etc.

Note, too, how the JS-30's power-shifted V conveyor with operator-controlled speeds up to 1,000' per



minute—another Cleveland exclusive—easily handled the big spoil volume from the wide-sloped trench. The JS-30 sloped the trench to 6' top width as it dug.

The JS-30 is a trencher of amazing utility  
—get all the facts now,  
from your Cleveland distributor.



# CLEVELAND TRENCHER

THE CLEVELAND TRENCHER CO., 20100 ST. CLAIR AVE., CLEVELAND 17, OHIO

PUBLIC WORKS for December, 1960

115

Key to Urban Development," "Refuse Collection Operating Procedures," "Traffic Controls and Parking Facilities," "Recent Developments in Public Works Equipment," "Suburban Sewer Service Policies," "A Review of Selected Air Pollution Control Developments," "Sealing and Patching Streets and Highways," "Methods of Back-filling Utility Trenches," "Legal Aspects of Public Works," and "Centralized Maintenance of Public Buildings."

This publication, containing over 400 pages, is being sent to all members free of charge as a regular membership service and is available to non-members at \$5.00 per copy from the American Public Works Association, 1313 East 60th Street, Chicago 37, Ill.

### Love Named President Of Texas Chapter

The Texas Chapter of APWA held its annual Fall meeting in Galveston, Texas, on October 2-4, with 41 in attendance. This meeting was held in conjunction with the annual meeting of the Texas Municipal League.

The newly elected officers for 1960-61 are: T. Spence Love, city

engineer, Houston, president; Jack M. Graham, director of public works, Corpus Christi, vice president; Albert W. Rollins, city engineer, Arlington, treasurer; and Stephen J. Matthews, executive director of the Texas Municipal League, Austin, secretary. Trustees are D. R. Voeklel, city engineer, Victoria and John T. Hickerson, director of public works, Lubbock.

A Monday afternoon session was held on slurry seals with P. G. Dieter, director of public works, Waco, as moderator. This session was followed by one on base stabilization covering such topics as lime, asphalt and Portland cement.

Other topics covered at the technical sessions included "Public Works and the Public," "City Mapping," "The Sale and Disposal of Sludge," and "Composting."

### New Orleans Chapter Studies Possibility of Sponsoring Student

A committee was set up at the October 5th meeting of the New Orleans Chapter of the APWA to meet with officials from Tulane University to investigate the possibility of sponsoring a student majoring in public works. The as-

istance would be in the form of a small cash fund.

James Janssen, principal gas engineer, New Orleans Public Service Inc., New Orleans, was appointed Chairman of the Committee. Other members include Louis Bisso, president, Planning Services, Inc., New Orleans, and Louis Buja, chief engineer, engineering division, Department of Streets, New Orleans.

Principal speaker at the meeting was Ray Burgess, director of the Louisiana State Highway Department, who discussed the Inter State Highway System and the aims and purposes of the Louisiana Highway Department.

• • •

### Underwater Storage for a Water Works

To provide emergency water storage, St. Petersburg, Fla., has installed two 10,000-gallon tanks 35 ft. under water in the Gulf of Mexico some 300 ft. offshore. These tanks are made of rubberized fabric and rest on concrete cradles. Pumps are provided which can deliver water to shore points in an hour. While the storage is primarily for drinking water supply, other liquids, as fuel, can be stored.

**From Boulevard to congested street**



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REVERSIBLE  
SNO-PLOWS  
clear the way—fast

Congested city streets call for quick action when snow strikes. FRINK Sno-Plows get in and clear the way fast. They're built ruggedly, for hard service . . . often are in nearly continuous duty during severe winter weather.

FRINK Reversible Sno-Plows with Trip Blades plow left or right or bulldoze straight ahead, end wasteful deadheading. Maneuverable for cleanup in areas of parked cars. Dependable for high-speed plowing in open stretches of boulevard. Several models available with hydraulic or manual reverse for trucks from 1½ tons up.

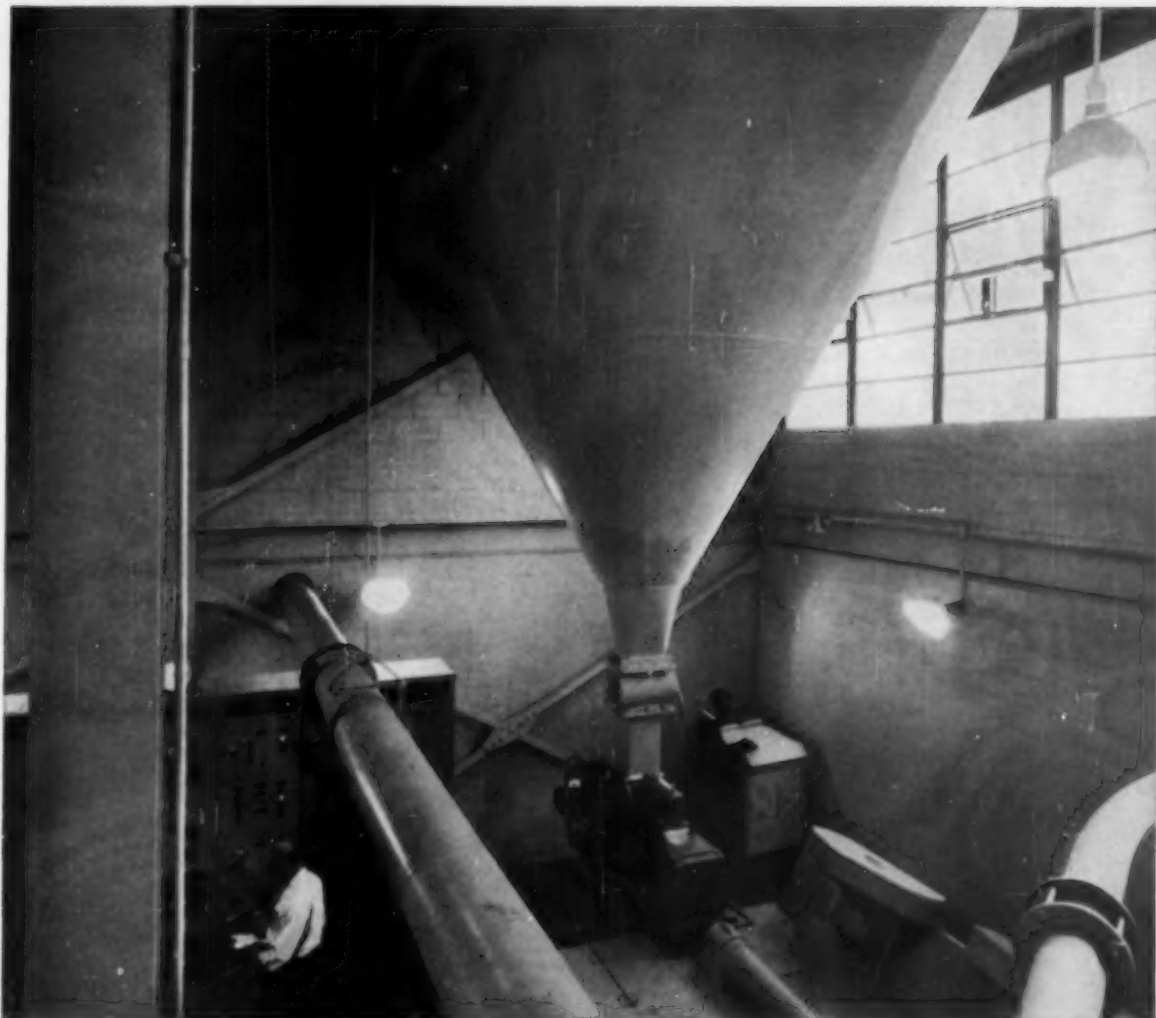
Send for full details on versatile FRINK Reversible Trip Blade Sno-Plows. Write for your fully illustrated catalog.

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## WHEN THE BEST IS REQUIRED PARLON IS FIRST CHOICE

Here's a photograph worth a million words. It shows the Chemical Feed Room at the Middlesex County Sewerage plant at Sayreville, N.J. Throughout this plant a protective coating must meet the challenge of chemical fumes. That's why Socony Paint Products Company's Sovaklor Chemical Resistant Coatings based on Parlon® chlorinated rubber were selected for walls, beams, hoppers, pipes and other equipment. Perhaps Parlon's long life, resistance to corrosion, and ability to cover almost any type of surface material can solve your maintenance problems. Your supplier of quality paint can tell you more about Parlon, or write direct to Hercules.

*Cellulose Products Department*

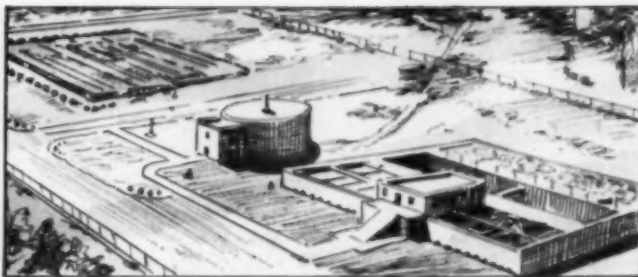
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# THE SEWERAGE AND REFUSE DIGEST



Prepared by ALVIN R. JACOBSON, Ph.D.

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

## Pleasant Hills Sewage Plant

The Borough of Pleasant Hills, situated in the South Hills Section of Metropolitan Pittsburgh, constructed and placed in operation its new sewage treatment plant pumping station in September, 1959. The plant is designed to handle 6 mgd peak flow, with provision for future facilities for an additional 6 mgd flow. The raw sewage flows through a comminuting screen and into a wet well. From there it is pumped to an aerated grit tank, the air being introduced through porous diffuser tubes placed about 2 ft. above the bottom of the tank. The grit is removed from the tank by means of a tubular conveyor into a hopper from where it is discharged into portable containers which are hauled away for burial. The sewage flows by gravity from the grit tank to two primary settling tanks, each equipped with straight line longitudinal and cross collecting sludge scraping mechanisms. The sludge is pumped to two digesters while the effluent flows by gravity to the four aeration tanks along with return sludge from the two final settling tanks. Air is supplied by two 3,000-cfm gas engine driven blowers, the engines being capable of burning either sewage gas or natural gas. Aeration tank effluent flows by gravity to the final settling tanks, entering each tank through a center feed well. Effluent from the final settling tanks flows to a chlorine contact tank before final discharge into Lick Run Creek. Sewage gas from the sludge digesters is utilized in sludge heating, gas engine operation and the heating of buildings. The digested sludge is dried on open air sand drying beds. The article shows a flow diagram for the plant.

"Pleasant Hills Sewage Plant". By John W. Townsend and Wallace J.

Beckman, Partner and Associate, Consoer, Townsend & Assoc., Chicago, Ill. *Water & Sewage Works*, October, 1960.

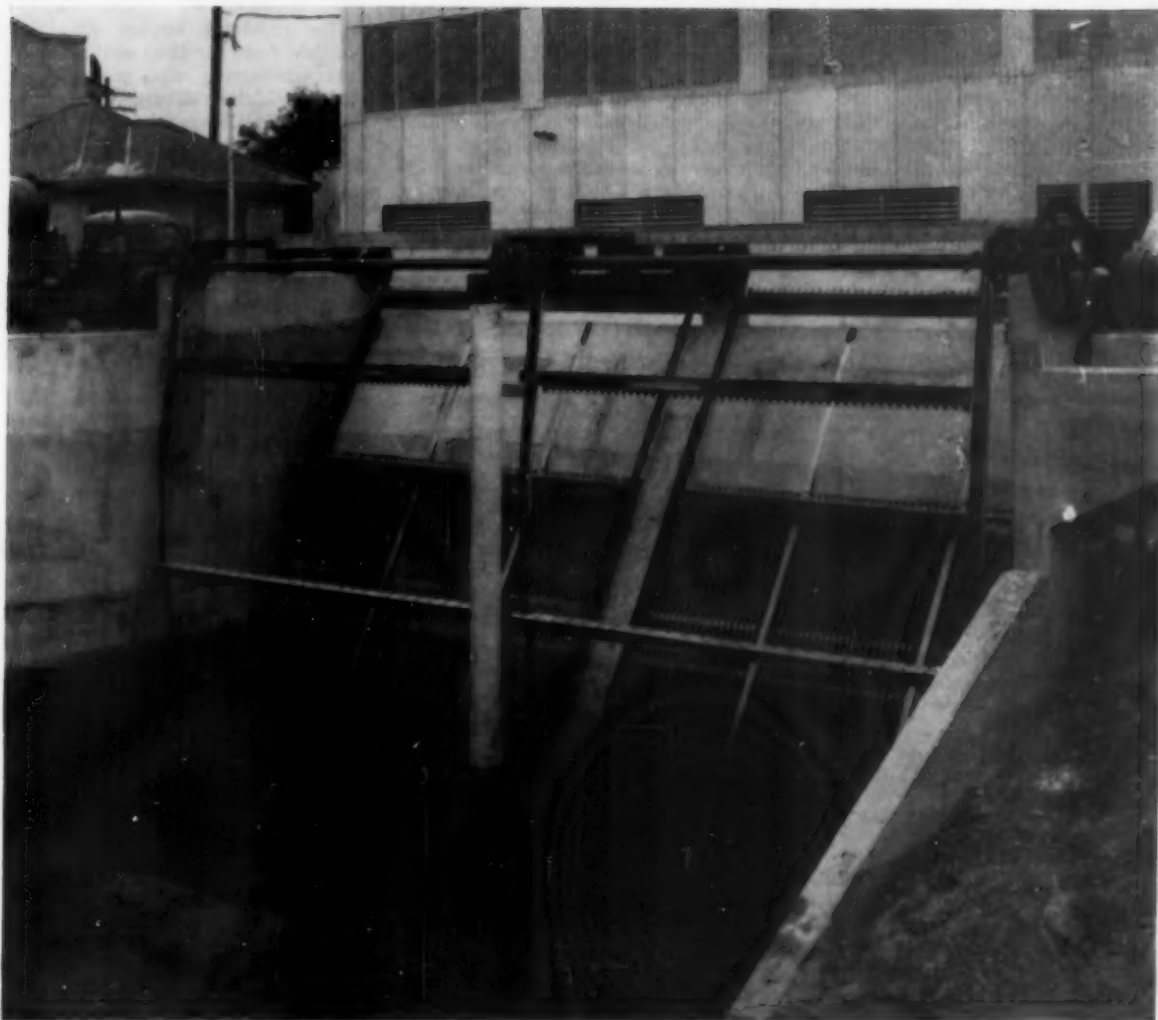
## ABS Assimilation

A considerable amount of laboratory study has been done to determine the effect of synthetic detergents on the various phases of sewage treatment and on the receiving stream but little has been reported on actual plant or stream experience. In this article the Metropolitan Sanitary District of Greater Chicago reports on data obtained on the assimilation of ABS (alkyl aryl sulfonate) in a full-scale treatment works—waterways system. Data was obtained from the three major activated sludge treatment plants and ten sampling stations on the Illinois Waterway. Flow data were available from the records of The Metropolitan Sanitary District of Greater Chicago and from the U. S. Geological Survey. These studies showed that approximately 50 percent of the ABS was removed in the treatment works confirming the laboratory and pilot-plant tests of others. These studies also showed that ABS was being added from communities situated on the upper part of the waterway and its major tributaries, i.e., above Morris, Illinois, causing an increase in the ABS content. Below this point there was a slow, steady assimilation of ABS by the stream. Further downstream, at Peoria and Pekin, where a further increase was expected, a decrease in ABS was found, suggesting the possible removal by chemical reaction rather than biological or physical.

"Assimilation of ABS By An Activated Sludge Treatment Plant—Waterway System." By Emanuel Hurwitz. *Journal Water Pollution Control Association*, October, 1960.

## Reducing Sewage Plant Odors

Odors emanating from the Sacramento, Calif., sewage treatment and disposal facilities resulted in conflicts between the community interests of needed waste disposal on the one hand, and residential land use on the other. The primary sewage treatment plant having a nominal capacity of 75 mgd serves about 250,000 people. During the canning season in August and September, five major food processing plants raise the biochemical oxygen demand to a population equivalent of about 750,000 persons. Chlorine is applied during the period May through October to the plant effluent which is discharged to the Sacramento River. Prechlorination, however, is maintained throughout the year for odor control. About 70 tons of chlorine are used for coliform control by post-chlorination, while approximately 650 tons are applied at the headworks for odor control. The hydrogen sulfide content increases from about 0.2 ppm at the pumping station to about 0.7 ppm at the headworks and is released to the atmosphere at the influent structure creating a significant odor problem. The chlorine solution diffuser was redesigned and now gives completely satisfactory control of odors due to sulfides. Another major source of odor was at the sludge pumping building where the incoming sludge lines have a free discharge some distance above the liquid surface in the sump. This free discharge resulted in the release of hydrogen sulfide. The aeration blowers located in this building were repiped so as to take their suction from the area above the collecting sump thereby removing the odorous gases. The third odor problem resulted from a slow start-up in the digestion process which was finally eliminated by the

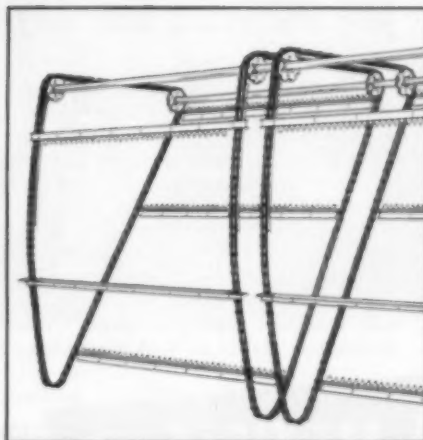


## NEW SELF-CLEANING TRASH RAKES

These Jeffrey storm water screens at Port Arthur, Texas have no sprockets at the bottom; they depend on the weight of chains and flights to keep them tight. The flights can push away, therefore, if some large object tends to jam the movement of the rakes.

This is special equipment designed to meet a special problem, the sort of assignment Jeffrey sanitary engineers like to tackle. They're expert, too, in all the usual problems faced in sewage and water treatment—have the long line of proven Jeffrey equipment with which to solve them.

Jeffrey offers complete technical information on plant layout and machinery. For this help, write The Jeffrey Manufacturing Company, 947 North Fourth Street, Columbus 16, Ohio.



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addition of 100,000 gallons of well-seeded sludge from a sludge digestion plant in the city of Stockton, Calif.

"Reducing Sewage Plant Odors in a Residential Area." By W. S. Hyde, M. ASCE, Supervising Engineer, Division of Water and Sewers, City of Sacramento, Calif. *Civil Engineering*, October, 1960.

### Aerobic Digestion

Over 400 aerobic digestion treatment plants have been approved by the Ohio Department of Health in

the past three years to provide high-degree treatment for "detached" schools, sub-divisions, trailer parks, and other installations, where municipal facilities are not available. In addition, three municipal aerobic digestion plants ranging in size from 50,000 gpd to 350,000 gpd, are under construction or in use at present. In this type of installation, the sludge from the final settling tank and a liquid volume equal to the average plant inflow are continuously returned to the aeration tank where the sludge is repeatedly aerated until it is completely oxidized. The superfine ash is carried

to the receiving stream with the overflow from the final settling tank thus eliminating the problem of sludge withdrawal, digestion, drying and final disposal. Rarely does suspended solids and BOD removal fall below 90 percent and in many cases the process removes 95 percent. At present studies are being made to expand the East Palestine, Ohio, conventional activated sludge plant to a capacity of 1,100,000 gpd. Several factors favor the aerobic digestion process over the conventional activated sludge process. Present plans call for the revamping of the present plant to treat 350,000 gpd by the aerobic digestion process and the installation of a new plant with a capacity of 750,000 gpd, and using the same process at a cost of approximately \$420,000.

"Aerobic Digestion—New Answer for 'Detached' Areas and Cities." By C. Robert Martin, Partner, Floyd G. Browne and Associates, Consulting Engineers. *Wastes Engineering*, October, 1960.

### Why Wait for Complaints?

The Port Washington Sewer Commission completed construction of its sewage treatment plant in 1952. It is a bio-filtration type with primary clarifiers, high rate trickling filters, secondary clarifiers and primary and secondary digesters. The plant is located near a residential area with a high proportion of high income families with relatively expensive homes. During the planning stage the Commission selected a 27-acre site which was found large enough to provide ample room for the sewage treatment plant as well as a 12-acre buffer zone between the plant and the residential area. Establishment of this buffer zone was the first step in an effective public relations program. The second step was the investigation by Airkem, Inc., of potential odor problems. As a result of the survey of the sewerage facilities, it was indicated that fixed odor control guns should be located at several key points, namely, the degritter tank, both primary clarifiers and trickling filters. In addition, portable units were recommended for spot use in the event of unusual conditions. The guns are operated by the plant air line and supplied by individual drums of Airkem counteractants, the counteractant reducing the odor level without masking. Odor control units are located at all twelve pumping stations. Annual cost for this odor control program varies be-



Breaking all records  
on nationwide  
demonstration tour —  
See it in your area

## SeweRodeR cleans far more sewer per man . . . per day . . . per dollar!

Public officials concerned with greater efficiency and upgrading working conditions in the Sewer Department will want to see a SeweRodeR demonstration when the team comes to their area. They'll see how one operator can rod from manhole to manhole non-stop, reaming out sludge and obstructions and restoring free flow in a matter of minutes. They'll see "case histories" showing the SeweRodeR can save up to \$264 per mile in cleaning costs, and pay for itself in six months!

They'll like these exclusive advantages: positive chain and dog non-slip rod drive; audible safety clutch to protect tools, pipe and machine; push-pull power from 4 to 4,000 lbs., instantly reversible; ability to work water-filled manholes; and many more.

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1005 Spencerville Road, Lima, Ohio

#### HOW YOU CAN SEE SeweRodeR IN ACTION

Write for date of demonstration in your area. We are making arrangements in many cities and will notify you well in advance. Be prepared to compare your present sewer cleaning methods and costs with SeweRodeR. You may discover an entirely new approach to saving important budget money!

clean, safe  
**WATER**  
for generations to come



Our nation's population growth requires water—clean water, and lots of it! Controlling pollution of lakes, streams and rivers means better public health and water supplies, new and improved vacationlands abounding in fish and wildlife. Local industries also benefit from unpolluted water supplies. Up-to-date sewage treatment facilities insure these continuing benefits. The following cases show actual benefits achieved by planned water pollution control.



## Everybody benefits from clean water

Abundant usable water is every American's birthright—and responsibility! Modern living takes good water away...modern technology alone can restore it.



### Clean, sparkling river water flowing into Wyoming's Glendo Reservoir makes it a great place for water sports!

The Glendo Reservoir on the North Platte River was ideal for recreation except for the untreated sewage being poured into the river by every town for 100 miles upstream. Then they all joined in a highly successful clean-up campaign. Ridding the

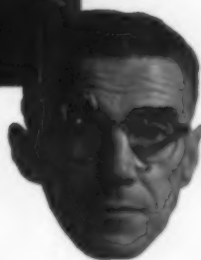
river of dangerous wastes not only took care of a serious public health problem—it gave everyone a delightful new recreation attraction after the dam was built. Boating, swimming and fishing bring many vacationers to the area each year.



**"They're catching bass in the Walnut River for the first time in 35 years!" say local fishermen.** Oil field, refinery and municipal wastes spoiled one of the prettiest rivers in southern Kansas. But the communities and industries along the Walnut River set up a *pollution abatement program* and each cooperated to carry it out. They've built new sewage treatment plants, eliminated oil field brines and set up waste treatment facilities at refineries. The river is being returned to its original beauty—a natural resource to be proud of!



**"Our water clean-up brought us new industry and jobs," says Mayor J. E. Keech, Cumberland, Maryland.** The city built a new sewage treatment plant (above) that will take care of all home and factory wastes, even with the growth expected in the next ten years. And that's one important reason Pittsburgh Plate Glass Company came to Cumberland! Their new factory will bring jobs for nearly a thousand people.



**Right next door to luxury homesites  
... treatment plant doubles as popular marina!**

An attractive and useful asset to the community is the sewage treatment plant at Clearwater, Florida. Its appearance would do credit to a fine yacht club. There are 45 boat slips for public use

at the Marina Station. Planned for the future, the plant's capacity for treating wastes will be more than adequate for the population expected when the area is fully developed.



# Treatment plant on a boulevard wins favor for engineers and city officials



## HERE'S HELP IN GETTING PUBLIC SUPPORT FOR ACTION ON POLLUTION PROBLEMS IN YOUR AREA

The pages you have just read relate a story that needs telling to the public. That's why PCA is reprinting this colorful insert—with a new fourth page—folded for easy mailing (shown at right.)

This mailing piece is available in quantity for use locally where help is needed to inform the public as to the urgency for obtaining adequate pollution control facilities.

For further information about this folder, or for help of any kind in planning your clean-up programs—just call on PCA.

**PORTLAND CEMENT ASSOCIATION**  
33 West Grand Ave., Chicago 10, Illinois



The Coral Gables, Florida, sewage treatment plant is truly a civic showplace. Walls are decorated with colorful scenes by famous artist John St. John. A well-designed, odor-free treatment plant is a credit to a community wherever it's located!



*A national organization to improve and extend the uses of concrete*

---

**SOME OF THE FINEST  
COMMUNITIES IN THE  
UNITED STATES  
HAVE INSTALLED**

---

**F&E** *multi-cell  
Incinerator Stokers*

---

**THERE MUST BE A REASON!**

- *Complete flexibility  
of operation*
- *Utmost in economy  
—reduced labor*
- *Rugged construction  
—lifetime dependability*
- *Progressive burning  
for maximum results*



*F&E Multi-Cell Incinerator Stoker  
installations represent a tonnage of  
over 20,000 tons daily.*

---



**FLYNN & EMRICH**

BALTIMORE 2, MARYLAND

---

tween \$800 and \$900 per year, the units operating primarily during the summer months, May through September.

"Why Wait for Complaints?" By John M. Pollock, Chairman, Board of Commissioners, Port Washington Sewer District, Port Washington, New York. PUBLIC WORKS, November, 1960.

#### Other Articles

"Symposium on Waste Stabilization Lagoons." Design, construction, operation and maintenance were reviewed at the symposium in Kansas City, Mo., Aug. 1-5, 1960. Report by Donald M.

Pierce, Chief, Section of Sewerage and Sewage Treatment, Div. of Engineering, Michigan Dept. of Health, Lansing, Mich. Water & Sewage Works, October, 1960.

"Treating Seasonal Sewage Flows." The Ruidoso, New Mexico Plant, financed by relatively few residents is effective in treating a seven-fold summer population. By Charles G. Caldwell, State Dept. of Pub. Health, Santa Fe, New Mexico. Water & Sewage Works, October, 1960.

"Cooperative Planning Solves Pollution Control Problems." Examples are cited of cooperation between cities and major industries and of several cities having joint ownership and operation

of pollution control facilities. By G. S. Rawlins, Consulting Engineer, J. N. Pease and Company, Charlotte, North Carolina. Public Works, November, 1960.

"Air Diffuser Efficiencies". Report of study undertaken at the University of Iowa. By Philip F. Morgan and Jantinder K. Bewtra, Respectively, Professor of Sanitary Engineering, and Research Assistant, State University of Iowa, Iowa City, Iowa. Journal Water Pollution Control Federation, October, 1960.

#### Aggregates Are the Backbone of Highway Construction

The need for the nation nearly to double its annual output of aggregates is suggested in a survey of the crushed stone, sand and gravel industry just completed by the American-Marietta Company. Highway construction expenditures can be forecast on the basis of anticipated increases in motor vehicle registrations in the next decade and a half. Best indications are that highway expenditures will have to be doubled by 1975. Presently about one-half of all production of crushed stone, sand and gravel goes into highway construction.

Taking a projected figure of \$12 billion for highway construction in 1975, American-Marietta applied to it a Bureau of Public Roads "usage factor" showing that 108,000 tons of aggregates are presently required per million dollars of highway construction cost. The result is an estimated demand for approximately 1,296,000,000 tons of aggregates for highway construction in 1975. This is nearly equal to present total consumption for all uses.

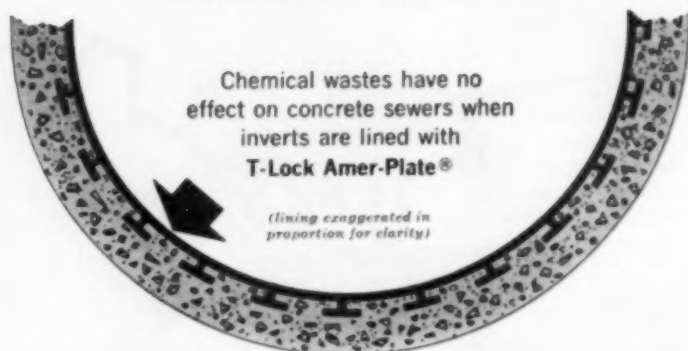
Looking at the 15 years just past, the survey points out that annual production of sand and gravel increased by more than 250 percent in the years from 1945 to 1960. In the same 15-year period, annual production of crushed stone increased more than 300 percent.

Copies of the survey on the aggregates industry may be obtained from the Department of Information, American-Marietta Company, 101 East Ontario Street, Chicago 11, Ill.

#### Geology and Highway Engineering

The 12th annual symposium on geology as applied to highway engineering will be held at the University of Tennessee, Knoxville, on Feb. 10, 1961. Nine papers are scheduled. More information from Mr. Robert A. Laurence, U.S. Geological Survey, Post Office Bldg., Knoxville 2, Tenn.

## How to Protect Concrete Sewers from Chemical Wastes



T-Lock Amer-Plate is a high polymer PVC sheet, easily cast into pipes, tunnels and structures to form a partial or complete 360° protective lining. Used in inverts, it permanently protects concrete from corrosive chemical effluents. In arch areas, it positively stops oxidized H<sub>2</sub>S corrosion. T-Lock is also highly abrasion resistant; impartial tests show that it abrades at only 1/70th the rate of concrete.

The fact that T-Lock ends erosion and corrosion problems in industrial and municipal sewer systems is attested to by more than five million square feet now in use. Write for complete data on this maintenance-saving lining before designing your next sewer.

Applicators strategically located throughout U. S. and Canada



Dept. 81 • 4809 Firestone Boulevard • South Gate, California

921 Pitner Ave. Evanston, Ill.	360 Carnegie Ave. Kenilworth, N.J.	2404 Dennis St. Jacksonville, Fla.	6530 Supply Row Houston, Texas
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119

## THE C-E RAYMOND FLASH DRYING SYSTEM...

**6** reasons why  
it's your best choice  
for sludge disposal

### IT OFFERS THESE FUNCTIONS:

**1. Drying...** Only the C-E Raymond System gives you *controlled* drying. This means that your filter cake is reduced to particles uniform in size...low and uniform in moisture content...highly suitable for use as fertilizer when sludge characteristics permit.

**2. Incineration...** The Raymond System provides the simplest, most efficient method of sludge incineration. It produces a sterile ash that is free of clinkers...requires less purchased fuel.

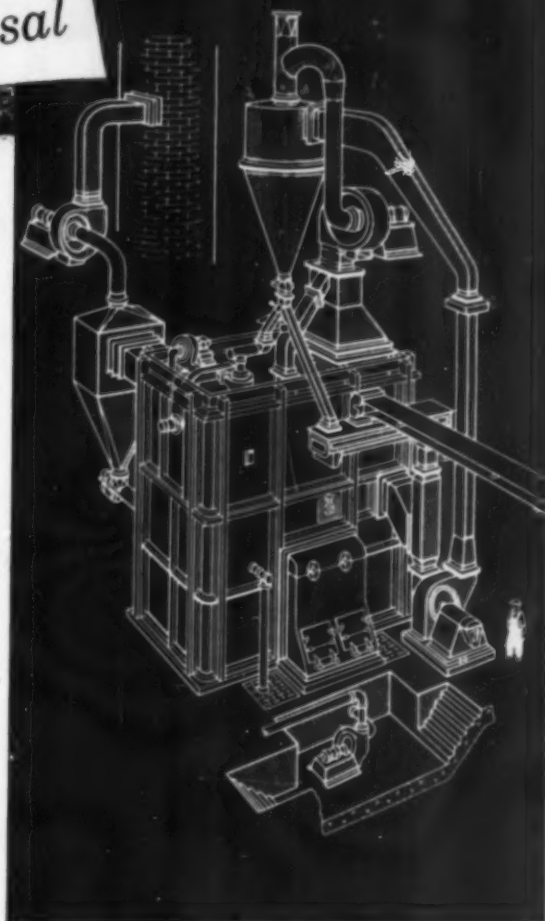
**3. Deodorizing...** The C-E Raymond System is the only one that offers high temperature deodorization to remove foul odors from combustion gases, as well as from sludge holding tanks.

### WITH THESE FEATURES:

**4. Superior Structure...** Instead of relying on multiple refractory arches, the C-E Raymond System utilizes small groups of arch bricks individually hung from steel supports above and outside the furnace. This not only makes arch failure virtually impossible, but permits very rapid start-ups and shut-downs...offering important man-hour and fuel savings.

**5. Economical Operation...** This system has a proved record of low maintenance costs. Not only is maintenance negligible, but the revenue gained from the sale of flash-dried sludge as fertilizer can help pay the operating costs of your plant.

**6. Proved Dependability...** More than a quarter of a century of use and development in plants throughout the United States and abroad has shown the capability of the C-E Flash Drying System.



*More filter cake is dried and/or burned in this system than by all other systems combined.*

For detailed information on the C-E Raymond Flash Drying System, and how it can benefit your community, contact the Combustion office nearest you. A C-E specialist will be glad to discuss your requirements with you or your consultants.

## COMBUSTION ENGINEERING

RAYMOND DIVISION, 427 West Randolph Street, Chicago 6, Illinois

Eastern Office: 200 Madison Avenue, New York 16, N. Y. • Western Office: 615 South Flower Street, Los Angeles 17, Cal.

Canada: Combustion Engineering-Superheater Ltd.



C-107B

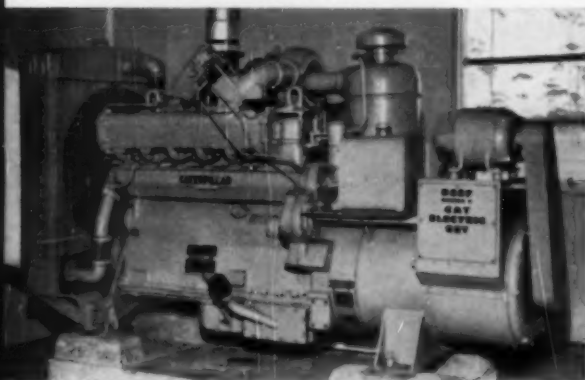
ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

# engine power

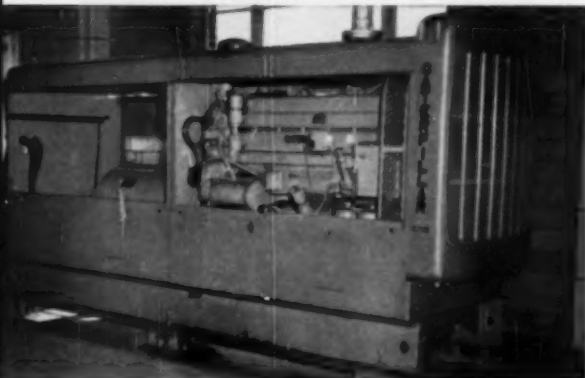
BY CATERPILLAR

## Prime power— Emergency power...

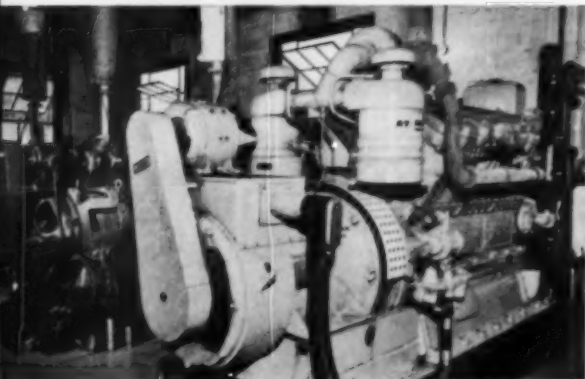
Cat D337 Electric Set in Plant D of Public Utilities  
Department at Fort Lauderdale, Florida.



Cat D326 Diesel Electric Set is used for standby  
power at Water Department in Warren, Ohio.



Cat 397 helps furnish power for the village of  
L'Anse, Michigan, which has a population of 2400.



### Whatever the job,

**Caterpillar engines will provide an  
economical, reliable investment**

In water works, sewage plants, or electric utilities, Caterpillar Engines prove their worth. In the town of L'Anse, Michigan, Caterpillar Diesels furnish power for a population of 2400. "I've been running Caterpillar Engines in our power plant for 20 years," the superintendent says. "During that time we've had only the best from the engines themselves and our Caterpillar Dealer."

At Plant D of the Public Utilities Department in Fort Lauderdale, Florida, Plant Supervisor Vernon Sheesley says, "Although our plant is relatively new, we are well satisfied with our Caterpillar Diesel Electric Set and the excellent service given by our Caterpillar Dealer."

At the water purification plant of the City of Warren, Ohio, three Caterpillar Diesels give dependable power—a D326 Electric Set is used for standby power in the purification plant, a D397 is on a standby pump to keep up water supply when electric pumps are down, and a D318 pumps water from reservoir to purification plant automatically on a low service pump at reservoir.

Superintendent J. Paul Price said that Caterpillar "had the product which was most suitable for this operation. Specifications were set up first and after the bids were in, it was found that Caterpillar equipment met the specifications best."

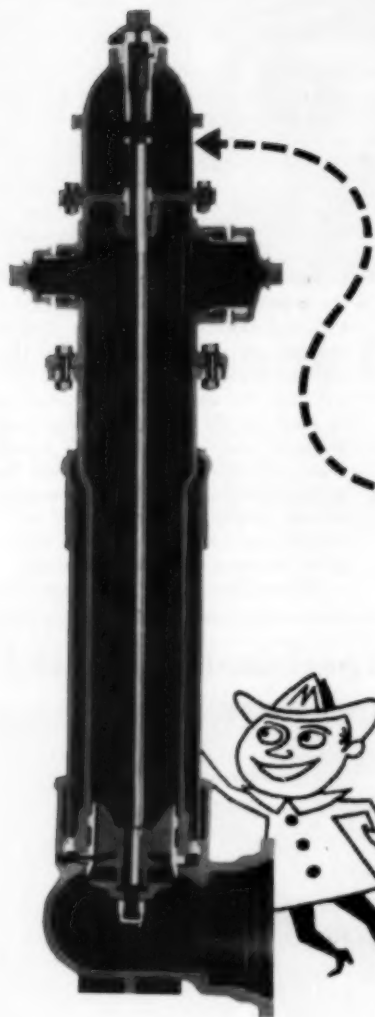
Lightweight, compact Caterpillar Engines are available up to 730 HP and in Electric Set ratings to 400 KW. The Caterpillar Natural Gas Engine is the lowest cost gas engine available. Call your Caterpillar Dealer. Whether it's for prime or standby power, he can show you why Caterpillar Engines help assure satisfaction.

## CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U.S.A.

# PUT ALL THESE FEATURES IN ONE HYDRANT AND YOU HAVE A **MATHEWS**



A dry-head hydrant; adjustable nozzle levels; replaceable barrel—three of many major features that help make Mathews the one hydrant for sound community protection. The Mathews is designed to be always operable, always dependable, always ready to deliver at full pressure.

## **STOP NUT PREVENTS STEM FROM BUCKLING**

The heavy bronze stop nut halts the downward travel of the stem just before the lower end touches the bottom of the elbow. This prevents any buckling stress on the stem when excessive pressure is put on the opening wrench.

## **AND ALL THESE OTHER FEATURES, TOO:**

All working parts contained in replaceable barrel • Head can be faced in any direction • Replaceable head • Any nozzles you specify • Nozzle levels raised or lowered without excavating • Leakproof because stuffing box is cast integral with nozzle section • Operating thread only part requiring lubrication • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • With bell, mechanical joint or flange pipe connections

Conform to latest AWWA specifications

## **R. D. WOOD COMPANY**

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

\*Manufacturers also of Mathews Flange Barrel Hydrants, R. D. Wood Hydrants, R. D. Wood Gate Valves, and "Sand-Spun" Pipe (centrifugally cast in sand molds)

## THE HIGHWAY AND AIRPORT DIGEST



Prepared by L. G. BYRD, Associate Editor

### Expressway Lighting

The Schuylkill Expressway within the city limits of Philadelphia is being lighted by contracts recently let by the Commonwealth of Pennsylvania. One section, the Vine Street Underpass, involved a 452-ft. underpass and an 822-ft. section of alternate open areas and short underpasses. Equipment specifications called for fixtures with two very-high-output fluorescent lights spaced to provide 36 foot-candles of maintained lighting for daylight operations. At night every sixth fixture is lighted to provide a 6 foot-candle intensity more acceptable with the 1.0 foot-candle lighting of the connecting highways. This same type of installation and ratio of day to night lighting is followed in the 30th St. Underpass and the 26th St. Underpass. On the main roads and ramps of the expressway, mercury street lighting, providing about 0.8 foot-candle of illumination, will be used. In all, 1,242 units, having built-in reactor-type ballasts and 400-watt mercury lamps are being used in the project. The lighting system will be operated and maintained by the City of Philadelphia where a 3-year group replacement plan is followed for mercury lamps.

"Modern Lighting for Philadelphia's Expressways." By Harold E. Mason, Street Lighting Engineer, City of Philadelphia, Pa. *Street Engineering*, October, 1960.

### Concrete Culvert Repaired

North of Grafton, Ontario, a large culvert-type underpass, 365 ft. long, 60 ft. wide at the base and 35 ft. high at the centerline, constructed of reinforced concrete with an average thickness of 18 inches, developed numerous horizontal and vertical cracks on the inside face, many extending to the full depth of the concrete. It was decided to use epoxy

resins as an experimental repair method on a 100-ft. section, based on research work with this material previously done by the Ontario Department of Highways. The epoxy resin was supplied by Flintkote Co. of Canada, Ltd. The application equipment provided by Phoenix Manufacturing Co. of Milton, Ontario, consisted of two air-powered pumps, hose and a pressure gun with a special mixing nozzle. The two components of the material were pumped separately to the nozzle where they were mixed and extruded. Discharge pressures up to 250 psi were obtainable but in this instance 120 psi was used. The equipment also heated the components as they passed from the container to the nozzle so that uniform viscosity, mixing and curing was maintained. The equipment can con-

trol the ratio of parts of the two components being mixed—in this case 2 parts epoxy to one part hardener. The crack filling operation included, first, cleaning the crack face with a wire brush and thoroughly drying. The crack was then sealed with a binder pressed into place with a putty knife and cured for 24 hours. Holes were then drilled along the crack, cleaned with air pressure and standard grease fitting nipples inserted. As soon as the binder was set the filling operation was carried out with the applicator gun attached to each nipple and the epoxy resin pumped into the void until it was filled and back pressure stopped the pump. Cores taken from the experimental section showed such satisfactory results that the entire tunnel is to be repaired in this manner.

"Epoxy Resin Provides Answer to

### Stockpile Storage Experiment Successful



Courtesy The Calcium Chloride Institute

● EXPERIMENTING with storage of bulk calcium chloride, maintenance officials at Sturbridge, Mass., have proved that material stores well outside and is completely workable even after five months storage. The 35-ton pile was placed on a bituminous pad, covered with six in. of sand and protected with a four-mil thick polyethylene tarp. Inspection at end of storage period revealed about 1½-in. of crust.



## 6 Michigans for Baltimore Highway Dept.

*City set for crippling snow storms, meanwhile speeds road repair, landfill work*

Like many communities south of the Snow Belt, the City of Baltimore, Maryland, needs heavy-duty snow removal equipment only occasionally. Specialized units just aren't economical. Yet, at times, only their efficiencies can unblock a snow-plugged city.

Obviously, this need can best be filled by machines which are good snow fighters as well as good dirtmovers. Baltimore's choice is Michigan Tractor Shovels—six of them!

### Snowbound . . . never again!

This vital selection was triggered by a "once-in-a-lifetime" snowstorm of two years ago. It stopped traffic for three days . . . kept most of the city's 982,000 people from leaving their homes. When streets were finally cleared—and the discomfort, inconvenience, and fire danger over—the City Government vowed, "Never again!"

Soon, they had written a 375 page master snow removal plan. Some 90 new plows were bought to attach to their trucks and graders. For fast clearing of the main trouble spots—405 linear miles, 1665 plow miles of principal streets and intersections—in came the six powerful, high-speed Michigans.

The main advantages of these units has proved to be their *dependability, speed, and versatility*. Equipped with plows, each four-wheel-drive, power-steered, torque-converter machine can clear a path 8 to 9 ft wide. With buckets—which interchange simply by removing four pins—units speedily load windrowed snow. And, in summer, they speed all kinds of dirtmoving and maintenance jobs . . .

### Assigned to street crews

Five of the machines—all 2 yd Model 125A's—are assigned throughout the dirtmoving season primarily to road repaving and grading crews. They shuttle at traffic speeds from job to job, clearing old pavement, digging and loading dirt, handling road material, etc.

### One Michigan speeds cleanup at three scattered sites

The sixth Michigan, a 2 3/4 yd Model 175A, handles cleanup and coverage at *two* landfill garbage dumps *AND* cleanup around a city incinerator. This 27 mph rig shuttles between sites under its own power . . . does and covers an average of 100 truck-loads of street dirt, tin cans and incinerator ash per 8-hour day.

"This rig—and our other Michigans—are doing a fine job!" says George V. Walters, Baltimore's general superintendent of highways. "The machines were purchased and delivered Sept 24, 1958, and as of this date we have had no tire troubles. Distributor service (from Paving Supply & Equipment Co) is excellent! We think every city could do well to investigate the fast, high-speed, dependable Michigan line!"



On typical landfill assignment Michigan dozes refuse over bank. Later the 2 3/4 yd rig will dig bank-run gravelly sand and carry it in for cover. Compaction is achieved during normal dozing both before and after coverage.

Michigan is a registered trademark of

**CLARK EQUIPMENT COMPANY**  
Construction Machinery Division

**CLARK**  
EQUIPMENT

2499 Pipestone Road  
Benton Harbor 29, Michigan

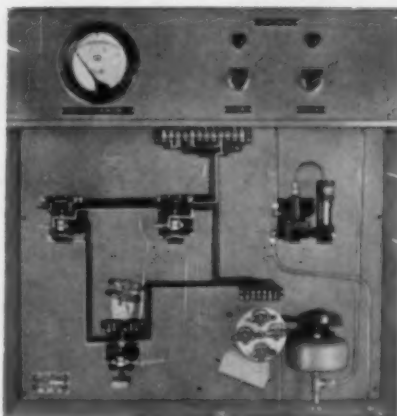
In Canada:  
Canadian Clark, Ltd.,  
St. Thomas, Ontario

## PRESSURE-OPERATED SUMP CONTROL

The RPS Rototrol is a pressure-operated sump control for starting and stopping pumps discharging out of a wet well. It is practical and dependable for either raw sewage or clear water—wherever accurate control of level is required.

The RPS is unaffected by changes in conductivity or build up in sludge. Has no moving parts in the wet well. Can be located anywhere. Requires only pressure connection between control and wet well. Operates from plant air or separate air compressor.

For full details, write for Bulletin RPS.



**FLOAT CONTROLS**—Healy-Ruff also makes a complete line of float-operated controls. Rototrol 940 permits each pump, up to 10, to have several starting and stopping positions. RF2 controls up to 8 pumps in sequence. Type 151 provides single pump control. Automatic alternator or transfer lugs available optionally.

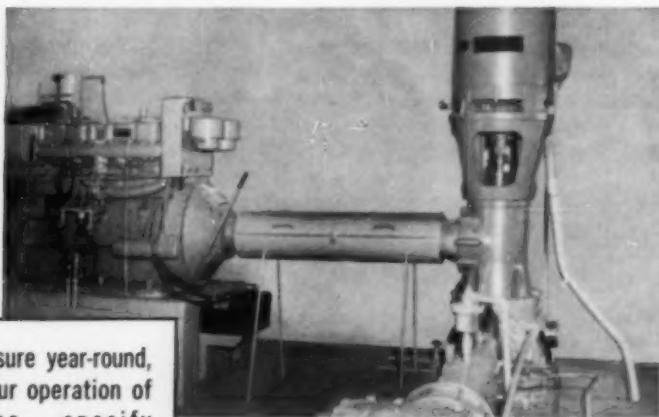
Write for descriptive literature.

## HEALY-RUFF COMPANY

791 Hampden Avenue • St. Paul 14, Minn.

First in dependable controls for waterworks and sewage—since 1929

Remote supervisory controls • Complete system controls • Elevated tank controls • Sump controls • Hydropneumatic tank controls • Float controls • Alternators • Alarm silencers • Protective devices



To insure year-round, 24-hour operation of pumps... specify

# JOHNSON

*Right angle*

**GEAR DRIVES**

Protects water supply, sewage and flood control operations against power failures; also permits overhauling electric motor or power unit without interrupting service. Thousands in use by municipalities, industry and farmers. Available in turbine or engine driven combination drive (as shown here), standard and dual types, with either hollow or solid shaft. Sizes: 15 to 450 hp. Write now for engineering catalogs.



**JOHNSON** • MAKERS OF FINE GEARS SINCE 1904  
**GEAR & MANUFACTURING CO., LTD.**  
8TH AND PARKER STREETS • BERKELEY 10, CALIFORNIA

East and Gulf Coast representatives:  
Smith Meeber Engineering Co., 157 Chambers St., New York City

Crack Repair in Concrete Culvert." *Roads and Engineering Construction* (Toronto, Canada), October, 1960.

## British Battle

### Parking Problems

In England too, the increasing pressure of growing urban parking requirements raises the question of responsibility for a solution; is it with Government, local authority or private enterprise? Only in the Road Traffic Act of 1956 did local authorities first acquire the right to charge a fee for parking on a highway through the use of parking meters. The Road Traffic Act of 1960 consolidates the provisions of the 1956 and other Acts giving permissive powers to local authorities. The only control to assure that local authorities develop any sort of parking plan is obtained through the processing of applications to the Minister of Transport for authorization to use parking meters on a highway. Private enterprise cannot develop comprehensive parking plans. Parliament has granted power to the local authorities where the responsibility for development of a long-range and comprehensive parking program must be faced.

"Responsibility for Parking—the government, local authority or private enterprise?" By John Brierley, City Engineer and Surveyor of Exeter, England. *Contractors Record and Municipal Engineering* (London, England), October 5, 1960.

## TV Traffic

### Control

The installation of 14 cameras on a 3.2-mile section of the John C. Lodge Freeway in Detroit this fall marks a new avenue of traffic control and driver behavior study. The Michigan experiment includes 11 sets of overhead lane and speed control signals at off ramps and nine "Ramp Closed" signs. Pictures from the TV cameras will be monitored and lane, speed and ramp signals controlled by push button in the central control room. From the control room the monitoring traffic engineers will also be able to make the cameras "pan" and "tilt," take telephoto shots and adjust for daylight or night conditions. When traffic conditions require, signals can be controlled to close ramps or lanes or reduce speed limits. Direct phone connections with the Road Commission and Police Dept. provide for quick emergency service. Sensing devices on the freeway will constantly provide the monitors with

# Hydro E-Z Packs save 4 hours per man per day!



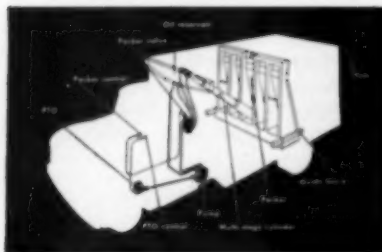
## "Eight E-Z Packs handle the load 64 dump trucks carried"—



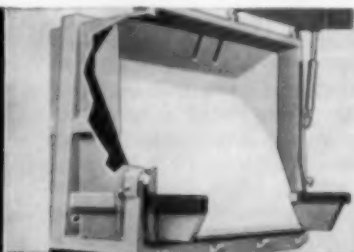
MR. C. E. COULTER  
Peoria Disposal Co.

In Peoria, Ill., the Peoria Disposal Co. makes money with a fleet of 8 Hydro E-Z Packs against tough competition. Loads baled under 76,600 lbs. pressure in the world's most powerful refuse compactor average 5 to 8 tons compared with only about 1200 lbs. carried in the company's old non-compacting bodies. Company President

C. Elmer Coulter reports that 8 Hydro E-Z Packs handle 4 times the load 16 dump trucks carried—and save 4 hours a man a day formerly lost on extra trips to the landfill! But see for yourself. See your Hydro E-Z Pack distributor or write us. We'll help arrange a demonstration and send you a free copy of "The Big Squeeze."



**Simplest** of all disposal bodies with the fewest working parts. No complicated chains, conveyors or whirling knives.



**Bulldozer plow** travels length of floor for compaction, beyond body for clean unloading of bale. No hoisting needed.



**Lower cost** with less depreciation since elimination of heavy and complicated mechanism decreases chassis requirements.



## HYDRO E-Z PACK®

HYDRO E-Z PACK DIVISION OF HERCULES GALION PRODUCTS, INC., GALION, OHIO — U.S.A.

# Sproule



**Good luck beats early rising.**  
—Irish proverb

**T**RUE . . . and no one knows it better than the man who clears the road at the crack of dawn in the dead of winter.

I sympathize, and offer help. Can't control the weather, of course, or its timing. But the next best thing is to control its effects . . . and for that, I have something. Calcium Chloride . . . the stuff that cuts ice control down to a man-sized job.

Ever kill the loader's engine on a pile of frozen abrasive? Sand premixed with chloride handles like sugar.

Or watch sand disappear with the first wave of traffic? Chloride anchors it.

Or seen a salt treated road freeze up in a quick temperature drop? Salt-chloride mixtures are effective down to 10 above. Straight chloride works at still lower temperatures.

Are you getting all the help you can from chloride? Our folder, "Melt or Skidproof Icy Surfaces with Wyandotte Calcium Chloride" covers some points you may have missed. Write for it. Wyandotte Chemicals Corporation, Dept. FS, Wyandotte, Michigan. Offices in principal cities.

**Wyandotte**  
**CHEMICALS**



MICHIGAN ALKALI DIVISION  
HEADQUARTERS FOR CALCIUM CHLORIDE

volume, speed and density data at various points in the study area. The experiment is being financed jointly by the U. S. Bureau of Public Roads, the Michigan State Highway Department and the City of Detroit. General Electric Company was successful bidder for providing the video and control circuits and equipment.

"Michigan's TV Experiment." By John C. Mackie, Michigan State Highway Commissioner and Director, American Road Builders Association. *American Road Builder*, October, 1960.

## Traffic Planning in Urban Renewal

For either to succeed fully, urban renewal and traffic and transportation planning must be coordinated. In the redevelopment of an area, all forms of transportation requirements should be considered and a functional segregation of traffic, by types and destinations, sought. New Haven, Conn., is developing a plan for placing pedestrian traffic on an elevated mall. The project area is tied to a major expressway connector, will be served by an underground roadway for commercial vehicles and includes strategically located parking facilities to minimize travel on local streets. Miami, Florida, is developing an area circumscribed by an expressway loop in cooperation with highway agencies. In Newark, N. J., Lansing, Mich., and Tulsa, Okla. downtown mall plans have been recommended. In England plans have been proposed for roof-top roads with buildings underneath. Futuristic thinking in this country is exemplified by plans for Horizon City, proposed for a site just outside of El Paso, Texas, where such features as complete separation of pedestrian and vehicular traffic are included. To evaluate properly travel needs and land uses and to estimate future trends of each, master plan development is essential. Critical to the success of transportation planning is the projection of traffic patterns and volumes to future years and to revised land-use patterns. Transportation planning must ultimately include parking and terminal facilities. New Haven, Conn., and St. Louis, Mo., are planning huge parking areas tied-in with urban expressways. In Orlando, Florida, a unique cooperative program with highway officials resulted in plans for an elevated expressway to carry Interstate traffic through town while local travelers park on the sheltered right-of-way beneath the roadway. Coordinated planning

also includes provisions for mass transportation such as the rapid transit line in the median of Chicago's new expressway west from downtown.

"Traffic and Transportation in Urban Renewal." By Wilbur S. Smith, Wilbur Smith and Associates, New Haven, Conn. *Civil Engineering*, Oct., 1960.

## Bridge Deck Replaced

Faced with deterioration of the 7-in. thick, concrete deck and concerned about vibration and live-load deflection, the Illinois Division of Highways rebuilt its Burr Oak Ave. Viaduct in Blue Island and increased the load-carrying capacity from an AASHTO rating of H18-S15 to H20-S16. Composite construction was selected as the most economical method of replacing the deck and stiffening the structure. Having established that the steel work was structurally adequate, shear-connector studs  $\frac{7}{8}$ -in. diameter by 4-in. long were end-welded to the upper flanges of the bridge girders. A total of 24,160 studs were used in bonding the new portland cement concrete slab to the steel beams.

"Increasing Bridge Capacity." By V. M. Romine. *Better Roads*, September, 1960.

## Median Guardrail

The Pennsylvania Turnpike Commission plans next year to complete the erection of guardrail between roadways on the entire east-west length from Ohio to New Jersey at a total program cost of about \$8 million. The New Jersey Turnpike Authority plans to have installed by early 1961 some 62½ miles of median double-beam guardrail costing about \$2 million. The entire New Jersey Turnpike is to have median guardrail except where the median strip is 90-feet wide. A study by the Bureau of Highway Traffic, Yale University, led to the recommendation that experimental installations of median barriers be made on the New Jersey Turnpike. Accident studies after this experimental installation indicated that it was beneficial in preventing accidental crossings of the 20 to 96-ft. grassed median.

"Turnpikes Plan Medial Beams." *Constructioneer*, October 10, 1960.

See page 138 for listings  
of other articles on  
highway and airport subjects



## Drainage pipe of corrugated Beth-Cu-Loy steel flexes with fill to distribute stresses

One of the reasons why corrugated galvanized copper-bearing steel is such an ideal material for drainage structures is its combination of strength and flexibility. This makes possible the use of light-weight, thin-walled culverts which flex with the fill without buckling under the stresses. In this transverse flexing action, the pipe draws support from the surrounding material, distributing the load peripherally instead of concentrating it through the vertical axis.

Flexibility also permits corrugated galvanized Beth-Cu-Loy pipe to take the heavy vibration of modern traffic, as well as the shifting and freezing actions of soils. Longitudinal flexibility makes grading and alignment easy.

With Beth-Cu-Loy galvanized drainage structures, there's less earth to remove, less to replace; the trench need be only as wide as the pipe. Field joints can be made easily and quickly, and the long pipe lengths (up to 20 ft) mean fewer joints and rapid installation.

Beth-Cu-Loy corrugated galvanized sheets conform to the rigid specifications of the AASHO. We shall be glad to furnish complete details about Beth-Cu-Loy sheet steel and how to solve your drainage problems with pipe made from these highly corrosion-resistant sheets. Just ask your fabricator, or write direct to us, for a copy of Booklet 425-A. Your inquiry will receive our prompt attention.



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... Economy  
... Versatility

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# BETHLEHEM STEEL



# Motor Grader

## DOUBLES AS PIPELAYER

**S**CRAP STEEL from a dismantled bridge, a motor grader that could be spared between county road maintenance tasks and the ingenuity of a road district supervisor, added up to economy of operation for a Mississippi County. Those were the ingredients that went into fabrication of an attachment which converts one of Harrison County, Mississippi's, five Cat No. 12 Motor Graders into a reinforced concrete pipe layer when needed.

The idea originated with Roy Dedeaux, supervisor of District No. 2, near Gulfport, in Harrison County. Rental costs of a 3/4 yard dragline, he knew, were prohibitive for county work and contractors' charges often amounted to 30 percent of the pipe cost. He wanted to save county funds by laying pipes up to 8-ft. diameter with regular county labor and machinery.

Mr. Dedeaux took his idea for a front boom to Nathan Lowery, service manager at the Gulfport Branch of Stribling Bros. Machinery Co., Inc., Caterpillar dealer in the area. Together, they worked out details for an 18-ft. boom to be fabricated from scrap steel with a worm drive Tulsa winch to provide necessary lifting power.

The boom is essentially a cross-braced A-frame with a three-position telescoping I-beam which can be extended to give a boom over-hang of 25 feet. The boom is pinned to the scarifier support at the front of the motor grader main frame with a single pin.

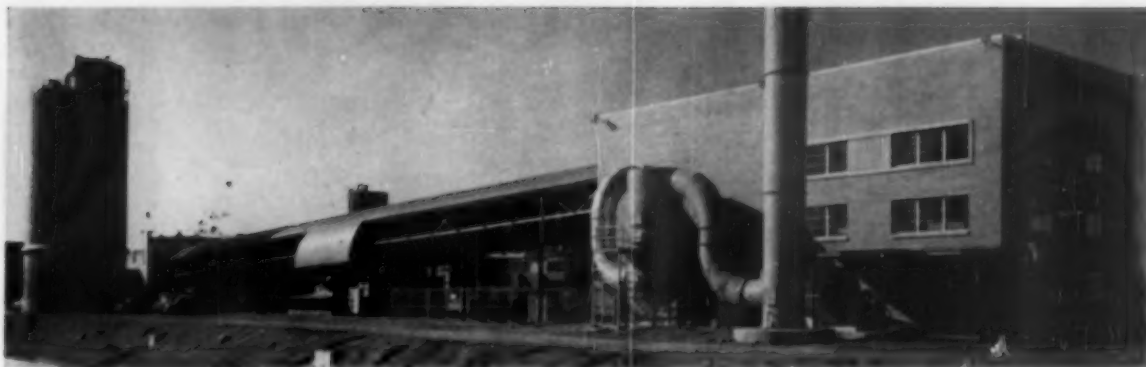
The guyline for the boom comes from a frame which rests in two vertical joints welded to the main frame atop the side-shift rack. A worm drive Tulsa winch is mounted atop the main frame and driven by the scarifier control shaft. A slip joint allows the scarifier control shaft to be disconnected from the winch and reconnected to the scarifier when the No. 12 is out for roadwork. Use of 13.00 x 24-18 ply tires on the front wheels allows handling loads of up to eight tons. The boom arrangement can be mounted or taken off in twenty to thirty minutes. The lifting capacity of the



● **MOTOR GRADER** is converted by addition of winch and home-made boom to a pipe-laying tool. Here the converted grader is handling a 36-in. concrete pipe section.



● **LIFTING** capacity is 8½ tons. This closeup shows how boom is attached to scarifier support with a single pin, permitting mounting or dismounting in 20 to 30 min.



**at City of Dayton —**

## **self-amortizing lime recovery plant designed around Magnetic Flow Meters**

Up to 150 tons of lime a day can be recovered by Dayton's Lime Recalcining Plant. City expects to get its \$1,330,000 plant investment back in 20 years — plus a surplus estimated in the millions. Consulting Engineers: Black & Associates, Gainesville, Florida.

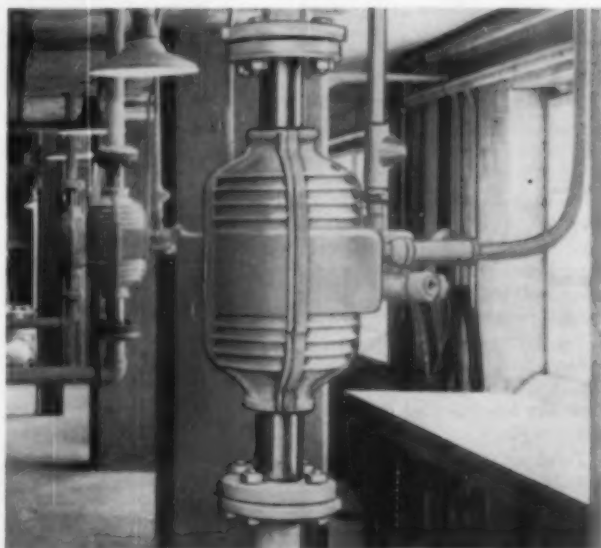
Dayton, Ohio's million dollar lime recalcining plant would warm the cockles of the thriftiest Scotsman's heart. Designed to recover lime used in softening city water, the plant actually recovers up to 20% more lime than originally added, with additional capacity to process most of the lime sludge accumulated over the last 5 years! City plans to sell the overage — recover its investment in short order.

Dayton's Lime Recalcining Plant was designed around Foxboro Magnetic Flow Meters. Sludge, which would foul-up conventional head-loss devices, is easily measured since these unique meters have no flow restrictions. Measurement is instantaneous—continuous—linear. Rate of flow to centrifuges can be controlled exactly.

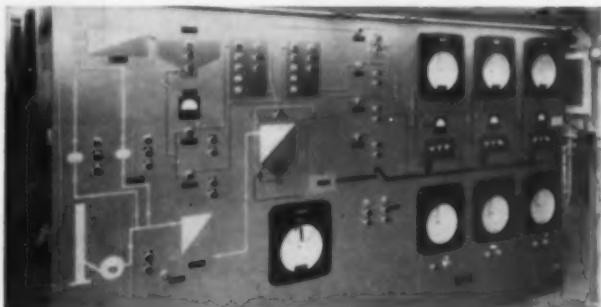
Maintenance on the Magnetic Flow Meter is practically nil. There are no pressure taps to get plugged or frozen . . . no seals or purges . . . no moving parts to foul.

For practically any liquid, however "difficult", you'll find the Foxboro Magnetic Flow Meter a sound investment. Find out about this fabulous instrument today. Ask your Foxboro Field Engineer for details, or write for Bulletin 20-14C. The Foxboro Company, 2612 Norfolk Street, Foxboro, Mass.

**FOXBORO**  
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**MAGNETIC  
FLOW METERS**



Three Foxboro Magnetic Flow Meters record and control the flow of sludge to centrifuges at Dayton's Lime Recalcining Plant. Meters cannot plug up because they have no flow restrictions.



"Graphic control panel in Feed End Building is helpful in breaking in new operators and in explaining the operation to visitors," reports Plant Supt. Robert C. Stout.



## Forum on Winter Maintenance

**A** WEALTH of experience in winter maintenance was presented by a panel of engineers from representative Northern states and the Bureau of Public Roads at the 10th Annual Technical Panel meeting of the Calcium Chloride Institute, held in October at Highland Park, Illinois.

Members of the Winter Maintenance Forum, participating in a full day of discussion on current practices and problems, included (as

pictured from left to right facing the camera): Harold J. Rathfoot, Chief Maintenance Engineer, Michigan State Highway Department (partially off camera); Henry E. Diers, Engineer of Maintenance, Illinois State Division of Highways; Richard W. Kress, Maintenance Engineer, Illinois State Toll Highway Commission; Paul Velz, Research Engineer, Minnesota Department of Highways; Lloyd G. Byrd, Associate Editor, PUBLIC WORKS, who acted as mod-

erator; Foster Smiley, Assistant Maintenance Engineer, Iowa State Highway Commission; G. Gordon Love, Assistant Chief Engineer for Maintenance and Equipment, Massachusetts Department of Public Works; William D. Dillon, Assistant Chief, Division of Development, U. S. Bureau of Public Roads, Washington, D. C.; and Charles E. Aten, Engineer of Maintenance, Wisconsin State Highway Commission.

William E. Dickinson, President of the Calcium Chloride Institute, Washington, D. C., is at the right end of the picture.

### Converted Motor Grader

(Continued from page 136)

crane with the 25-foot boom fully extended and using a straight cable from the winch to the object is 8½ tons. Capacity with one block is increased to 10½ tons. According to Mr. Dedeaux, capacities of more than those lifting totals noted above have not been necessary, so no absolute maximum has been set. He notes, however, that experience has shown that by tying to a false piling, the machine can be made to pick the tandem end of a grader off the ground.

Total cost to the county for the attachment was \$482 for labor, materials and fabrication—which was more than paid for on the unit's first job, according to Mr. Dedeaux. Rental of a dragline for that job would have cost in excess of \$500.

Among other projects, the attachment was used to lay approximately one-quarter mile of 72-inch pipe and 300 yards of 54-inch pipe for residential drainage. Approximately the same amount has been laid on county roads.

When placing pipe, the men find this arrangement safer than a dragline since, unlike a dragline operation, the pipe itself does not swing so much from side to side and a more positive move up or down is possible. Dollar savings are also possible, since the pipe does not have to be placed where it will be within reach of the boom, as is

necessary with a dragline or other crawler-mounted boom.

There was a further bonus not realized until the unit was put to work. When a section of pipe is in alignment, it can be moved longitudinally to make a solid connection simply by leaning the wheels of the motor grader—a time and back saver.

In adverse conditions of mud and slush, the winch as installed, is a money saver, due to the motor grader's maneuverability on the highways. Used for returning cars to the road, it often saves hauling of one of the county's tractors to the scene on a low boy.

In addition to the five No. 12 Motor Graders mentioned, Harrison County owns the following construction equipment: One D7; six D6s; one D4; and two No. 112 Motor Graders.

• • •

### Other Articles from the Highway and Airport Digest

"The Bump at the Bridge." Cause and preventive measures for approach settlement on highway bridges. By William S. Gardner, P.E., Woodward-Clyde-Sherard and Associates, Philadelphia, Pa. PUBLIC WORKS, November, 1960.

"Washington Uses Radio to Increase Street Capacity." Master control of traffic signals coupled with UHF transmitters and local controllers has improved traffic flow. By F. E. Twiss, Deputy Director for Traffic, Engineer-

ing and Operations, Department of Highways, Washington, D. C. PUBLIC WORKS, November, 1960.

"Land Use Development and the Highway Interchange." Uncontrolled development around the new Interstate interchanges may seriously affect the capacity and safety of the highway system. By David R. Levin, Chief, Highway and Land Administration Division, Bureau of Public Roads, U. S. Department of Commerce, Washington, D. C. PUBLIC WORKS, November, 1960.

"Taxes and New Road Estimates." More sophisticated techniques than currently employed, will be required if highway planners are to be assured that they have accurately predicted the demand and financial backing for a new route. By Allen D. Le Baron, Economics Department of Colorado State University, Fort Collins, Colorado. Traffic Quarterly, October, 1960.

"Trans-Hudson River Vehicular Origin and Destination Survey." A new origin and destination survey technique, called "continuous sampling," is described. Reported by Warren Lovejoy, Transportation Economist. Public Roads, October, 1960.

"Surfaces, Seeing and Driving." A two-part article taken from a paper presented at England's Association of Public Lighting Engineers Annual Conference. By J. M. Waldram, Research Laboratories of the General Electric Co., Ltd. Contractors Record and Municipal Engineering (London, England), September 21 and September 28, 1960.

"Designing Better Freeways." Geometrics and their effects on driver behavior. By George A. Hill, District VII Engineer, California Division of Highways. Traffic Engineering, October, 1960.

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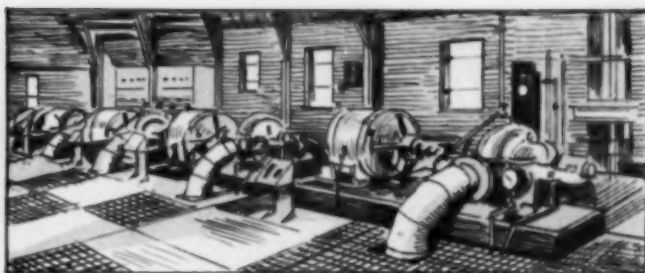
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## THE WATER WORKS DIGEST



Prepared by **ALVIN R. JACOBSON, Ph. D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

### Water Defluoridation

The removal of excessive fluorides from water supplies to prevent fluorosis, loss of teeth and increased cost of dental care is a sound public health procedure. Three methods of defluoridation have proven practicable. Two of these methods involve the use of either activated alumina or bone char through which the water percolates, the fluorides being removed by adsorption on the granular filtering media. The third method is dependent upon the use of magnesium in the form of dolomitic lime. The activated alumina is used in mesh sizes between 28 and 48 and is currently selling for 15 cents per pound, weighing 50 pounds per cubic foot. The Bartlett, Texas, plant using activated alumina contains 500 cubic feet of media in a standard, circular, steel filter tank 11 feet in diameter and 11½ feet high. The 60 inches of media is supported on 12 inches of graded gravel over an underdrain system. The plant reduces the fluoride from 8.0 mg/L to an average of 1.0 mg/L at a rate of 400 gpm. The plant is periodically regenerated by means of a caustic solution which is applied counter currently thereby combining in one operation the backwashing step and the caustic application. Bone char is used as the media at the plant at Britton, South Dakota, where the water is pumped from any of three wells through the pressure type of unit. The media is regenerated by pumping caustic soda through the bed. No plants have yet been built specifically for fluoride removal using the magnesium process. This method would probably be primarily used for water requiring softening and a simultaneous removal of fluorides. For levels of fluoride above 3.0 mg/L this method would probably require an excessive and uneconom-

ical dose of lime. The problems related to the operation, control and maintenance of defluoridation plants are no more difficult than those encountered in conventional water treatment plants.

"The Partial Defluoridation of Water." By F. J. Maier, Sanitary Engineer, Division of Dental Public Health, U. S. Public Health Service. *PUBLIC WORKS*, November, 1960.

### Radiation Exposure On Animas River

Recently the U. S. Public Health Service completed a comprehensive study of radioactive pollution of the Animas River, an interstate river, flowing south from Colorado into New Mexico. The study was conducted as the result of the Animas River receiving wastes from a uranium ore refinery located in Durango, Colo. The most hazardous radioactive waste material discharged

from the refinery was Ra<sup>226</sup>. The river is the main source of water for the area and is used for recreation, irrigation and waste disposal. The study carried out over a period of one year included analysis of river water, river muds, and river biota collected along the 60 mi. of the Anamis River, south of Durango. Samples of raw and treated water supplies, milk, vegetables grown locally, and rainfall were also analyzed. All samples were analyzed for gross alpha and beta radioactivities, as well as for Ra<sup>226</sup>. Selected samples were analyzed for Sr<sup>90</sup>, Sr<sup>89</sup> and certain other fission products. Results of the study indicated that the average Ra<sup>226</sup> intake from the water supply at Aztec, New Mexico was 109% of the recommended limit of 7.3 µmc/day. Only about 3% of the allowable amount of Sr<sup>90</sup> was ingested from this source. From all sources the

## PIPE PROVIDES WATER STORAGE

**W**HEN THE town of Albion, Washington, needed a water supply reservoir that is exactly



what it got—in perhaps the strangest form conceivable. Albion's reservoir is a 60-inch jointless concrete pipe, extruded in place, encircling the crown of a hill above town. The result is an excellent water storage facility at a low cost.

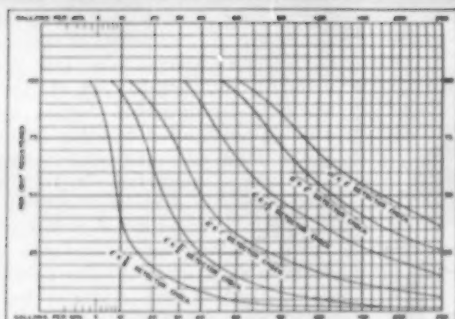
Builder was the R. A. Hanson Company, Inc., Palouse, Washington. A special machine casts jointless concrete pipe directly in trench excavations, using the undisturbed earth of the trench as an outer form. The trench is machine-excavated to the exact dimension for the diameter required. Grade is controlled to close tolerances through an automatic grade control device which is adapted to either the excavating machine or the Extruda-Cast machine.

# HERSEY

## *Detect Leaks and Still Get Minimum Loss of Head Through Fire Protection Service Lines*



Hersey Model DC (Detector Check) made in 2", 3", 4", 6", 8" & 10" sizes, equipped with a Hersey Disc Meter on the Bypass to indicate the use of water and measure accurately the lower rates of flow, will in case of necessity deliver automatically large volumes of water without obstruction.



**PER CENT REGISTERED**

The loss of pressure through Hersey Detector Checks, at all rates of flow up to the full capacity of each size, is less than 4 pounds per square inch.

This device is designed to detect leakage or use of water from services which are intended to be exclusively for fire protection needs. Sizes from 3" to 10" are listed as standard under the re-examination service of Underwriters' Laboratories, Inc. and approved by Factory Mutual Laboratories for use in Factory Mutual insured properties, also listed by Underwriters' Laboratories of Canada.



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peoples of Aztec ingested approximately 226% of the combined allowable amounts of  $Ra^{226}$  and  $Sr^{90}$ . Remedial measures that were provided to reduce human radiation exposure below recommended limits included removal of radium-bearing ore from the water by sedimentation, 70% removal of soluble  $Ra^{226}$  by chemical treatment and the installation of lagoons.

"Estimating Human Radiation Exposure on the Animas River." By Ernest C. Tsivoglou, S. David Shearer Jr., John D. Jones, and Don A. Clark. Respectively, San. Engr. Dir., Sr. Asst. San. Engr., Asst.

Sanitarian, and Chemist, all of Radiological Pollution Activities, Div. of Water Supply and Pollution Control, Field Operations Sec., Robert A. Taft, San. Eng. Center, Cincinnati, Ohio, *Journal AWWA*, October, 1960.

#### Pipeline Carrying Capacity

Studies made by the Chemistry Section of the State Water Survey Division at Urbana, Illinois, have shown that calcium, alkalinity and pH serve to inhibit corrosion. When their proportions are such that a condition of sufficient supersatura-

tion exists with respect to calcium carbonate solubility, the tendency toward corrosion and tuberculation can be made essentially non-existent. Further, when this proportion is such that the pH of saturation is low—that is, with more calcium and higher alkalinity—the saturation index necessary for protection approaches zero. But as the calcium and alkalinity concentrations decrease, it becomes increasingly difficult to overcome the tendency toward corrosion and tuberculation. Higher rates of flow also aid in inhibiting corrosion by bringing the protective ingredients more rapidly and in greater amount to the point of corrosion reaction on the pipe surface.

"Loss in Pipeline Carrying Capacity Due to Corrosion and Tuberculation." By Thurston E. Larson, Head, Chemistry Sec., State Water Survey Div., Urbana, Ill. *Journal AWWA*, October, 1960.

## FOUR reasons why Ford covers offer greater protection and convenience for every meter box installation . . .

1  
2  
3  
4

### DOUBLE LID METER BOX COVERS

Designed to provide the utmost in frost protection for pit meters, the "Wabash Cover" has a total depth of 9½ inches. Its extra depth, sloping skirt and 4" dead-air space between inner lid and top lid minimize heat loss from the top of the meter setting.

These covers can be provided in "standard weight" for ordinary service, or "extra heavy," when the lid will be exposed to traffic.



### SINGLE LID METER BOX COVERS

Designed for sidewalk or lawn installation, Ford "Type A" covers are made for 15", 18", 20" and 21" meter boxes. Lids are inset.

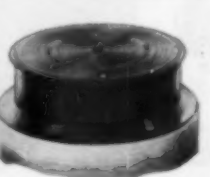
Lifter Worm lock used on these covers helps speed meter readings. Screw jack action plus automatic attachment of the key to the bolthead make lid removal a simple, clean task.



### MONITOR COVER

Designed for use on large tile—where a large lid opening is desirable—"Monitor Covers" consist of 1) a flange casting to fit on the tile, 2) a ring centered in place on the flange by a circular bead, and 3) a top lid with Lifter Worm Lock.

These covers can be used for 1½" and 2" meters . . . or for two or more smaller meters. Lid size permits meter reader to enter setting if necessary.



### HINGED LID

Designed for same installations as other single lid covers, "Type X cover" features hinge effect so lid can simply be leaned back instead of lifted off while meter is read.

Simple, ingenious lugs in the frame casting pivot the lid and support it. Thus, if desired, it can also be completely lifted off.



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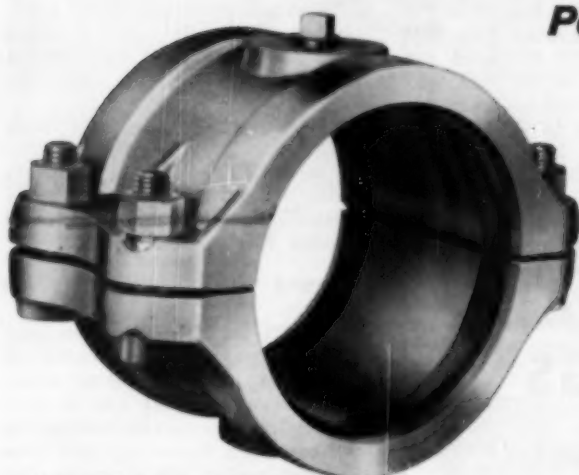
**FORD**

### Filter Washing Goes Modern

The task of washing filters is time-consuming and becomes a drudgery. Automatic washing systems can perform this task with a degree of dependability that insures maximum plant efficiency and lowest possible operating cost. The disadvantages of manual systems are principally three: 1) The operator must remain at the controls for virtually the entire washing cycle; 2) the possibility of the operator's pushing the wrong button or turning the wrong switch is ever present; 3) a valve may fail to respond to the operator's command without the operator's knowledge of such failure. Of the three drawbacks, the second one, which is due to human error, is by far the easiest to guard against. Undesirable flow paths through the filter may be prevented by the use of interlocks, even though the operator pushes the wrong button or turns the wrong switch. A number of sketches of interlocking systems are provided in this article. An electrical alarm or annunciator system may provide notification of valve failure. Fully automatic washing systems have one disadvantage in that the washing cycle may be triggered at the peak flow period. For this reason it is advantageous to leave the decision as to when the filter should be washed to the operator based on his experience. Systems are possible which will bring the entire washing cycle to a halt in the event of component failure, resuming operation only when the failure has been corrected. The range of avail-

# NEW CLOW

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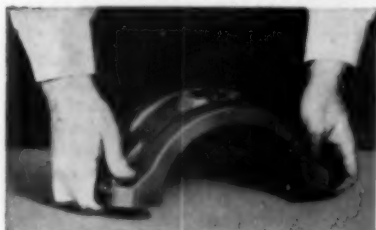


*Permits easier, quicker,  
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4", 6" & 8" transverse  
cast iron pipe  
underground breaks*

**LIGHT WEIGHT** Assembled 4" diameter sleeve weighs but 26 lbs. Weight of 6" sleeve is 32 lbs., 38 lbs. for 8" sleeve.

**SHORT LENGTH** Effective length of 4 inches between end seals on all sizes. Overall length is 6 1/4".

ASSEMBLED IN 3 EASY STEPS



Once the damaged pipe is uncovered, one half of the sleeve is placed on each side of the pipe.



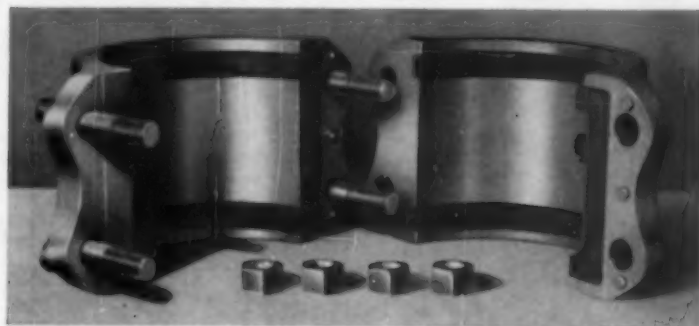
Sleeve halves are drawn together. Pre-assembled rubber gaskets make tight seal.



After the bolts are taken up finger-tight, tightening the four bolts by wrench completes assembly.

**TWO-PIECE ASSEMBLY** No end glands. Side and end gaskets are pre-assembled and cemented in sleeve grooves.

**HIGH STRENGTH** All parts are high tensile and corrosion-resistant. Sleeve halves are 70,000 psi tensile ductile iron. Nuts and bolts are high strength, corrosion-resistant alloy.



**HERE'S ALL THERE IS TO IT!** Illustration shows two-piece glandless construction. Side gaskets overlap ends of circumferential gaskets for tight seal. Four bolts are only accessories. Tapping boss on each half allows maximum tap of 2 inches. Regularly furnished with one sleeve-half tapped for 3/4" pipe.

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able features is as broad as the pocket book in terms of dollars and cents.

"Filter Washing Goes Modern." By M. William Herman. Systems Application Engineer, Fischer & Porter Co. *Water Works Engineering*, October, 1960.

#### Anion Resin Regeneration

The demineralizer plant at the Paulsboro, N. J., refinery of Mobil Oil Co. consists of seven cation units and six anion units, each 9 ft. in diameter by 20 ft. high, designed to treat up to 1800 gpm of water

for chemical purposes. Through the years various types of anion resins have been used; an early type of phenolic-polyamine type was replaced by a later phenolic type which was recently replaced by a polystyrene-polyamine resin which has proved to be the most stable of all three types. However, a problem of rinse requirements for regeneration of this resin became apparent. At first, soda ash was used as the regenerant, then caustic soda was adopted because it increased the resin capacity but at the same time it increased the volume of water required for rinsing to an excessive

amount. To overcome this problem a series of laboratory studies were made to determine the feasibility of using ammonium hydroxide, a weaker alkali than caustic soda, for the purpose of regeneration. On that basis of these tests ammonia was adopted as the regenerant and has solved the problem of excess rinse requirements, reducing the rinse time in half on the aged resin at cold water temperatures. In addition, the ammonia cut regenerant costs about 16% and saved about 70% of the rinse water previously wasted.

"Ammonia Regeneration of Weak Base Anion Resin." By S. B. Applebaum and F. Fast, Cochrane Corp., Phila., Pa., and Mobil Oil Co., Paulsboro, N. J., respectively. *Water & Sewage Works*, October, 1960.

#### Demand Rates

The City of Milwaukee has used a new approach to the problem of establishing demand rates taking into account the peak rate of flow drawn from the utility system by the customer. Essentially, the rate has two parts: (1) A commodity charge; and (2) an extra-capacity charge. The commodity charge, 7.5 cents, is for each 100 cu. ft. of water used during the month. The monthly extra-capacity charge, \$4.50, is for each 100 cu. ft. of water taken per hour in excess of the average annual hourly amount used during the current and preceding 11 months. The Wisconsin Public Service Commission's decision that the customer would pay the expense of the demand meters led many of them to sign agreements with the utility whereby the utility was to furnish, install, and maintain the meters at a monthly rental charge. The result of this program has been the installation of many water-conserving devices, especially in air-conditioning systems. The need for less expensive demand-metering equipment is expressed by the author.

"Demand Rates and Metering Equipment at Milwaukee." By Arthur Rynders, Supt., Water Dept., Milwaukee Wis. *Journal AWWA*, October, 1960.

#### Other Articles

"Diatomite Filtration Proves Economical Standby for Water Plant" at the City of Hudson, N. Y. By Howard Harding, Superintendent of Public Works, Hudson, N. Y. *Public Works*, November, 1960.

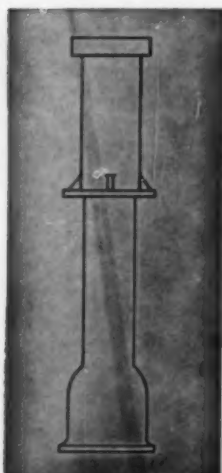
"Principles of Rate Making." A comprehensive discussion of this very important subject. By Samuel S. Baxter,



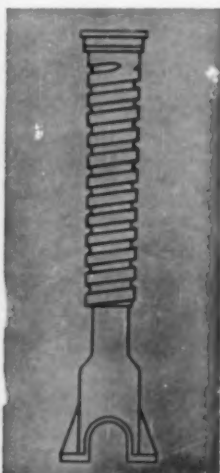
## BUFFALO MUNICIPAL CASTINGS

are available in every size and style!

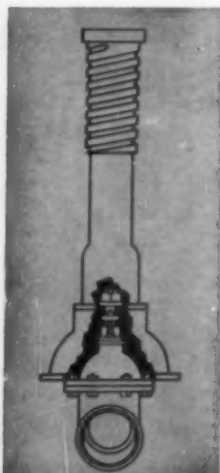
No matter what size, shape or style municipal casting you may desire — you're practically sure to find a "Buffalo" casting to serve your needs. Or, where desired, castings may be made to your own specifications. Whether you need valve, service or roadway boxes, meter boxes, manhole rings and covers or other municipal castings, you'll find all "Buffalo" castings designed for service and dependability.



2 pc. sliding type  
adj. 5 1/4" valve box



2 1/2" water or gas  
ext. service box



3 pc. screw type  
5 1/4" valve box

Prompt quotations given on all your standard or special gray iron or non-ferrous castings.

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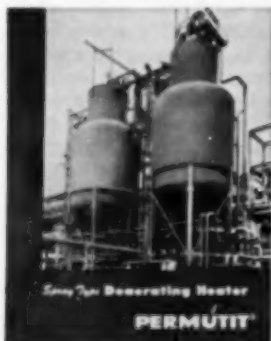
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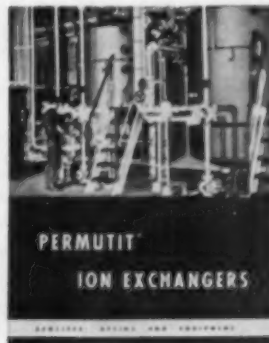
**Water treatment chemicals:** Permutit offers an extensive line of specialized chemicals. Typical data available: **Bulletin CS-105** on Wisprofloc-20 Coagulant Aid, **Bulletin CS-111** on Neutralizing Amines, **Bulletin CS-110** on the Permutit Briquet System.



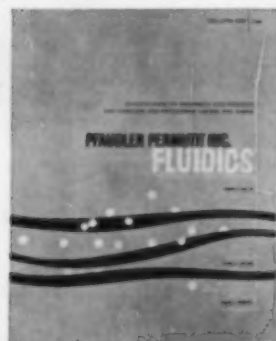
**Standard packaged demineralizers:** Factory-assembled, systems ready to connect and operate. For summary of applications, plus data on mixed-bed, two-step, non-regenerable and skid-mounted units, send for **Bulletin 4721.**



**High-capacity water softening:** New Permutit® Model BD Softeners answer need for more soft water at lower cost. Details on operation, specifications and performance are in **Bulletin 4696.** Industrial water softening with Permutit automatic equipment, Multiport Valve,® cation exchange, (zeolite) sodium cycle, systems and operation is described in **Bulletin 2386.**



**Ion exchangers:** From Permutit—the only company to manufacture ion exchange resins and the equipment in which they are used—you can get a brief manual on use of ion exchange as a unit process for purification, recovery, addition, separation, concentration. **Bulletin 2508** covers Permutit resins and equipment.



**How FLUIDICS works for you:** Buyer's Guide surveys equipment for water and waste treatment, ion exchange, gas analysis, metering and control. Also equipment for handling corrosives, heat transfer, reactions, centrifuging and packaging. Send for **Bulletin 992.**



**"New" metals for processing:** Tantalum, titanium and zirconium are finding increased use, because of their exceptional corrosion resistance and strength. Corrosion, heat transfer and general application data on these metals, plus equipment available, are discussed in **Bulletin 978.**



**Treating industrial wastes:** **Bulletin 4486** discusses types of industrial waste problems, equipment used, typical waste treatment systems.

\*FLUIDICS is the Pfaudler Permutit program that integrates knowledge, equipment and experience in solving problems involving fluids.



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| <input type="checkbox"/> 2508 Permutit Ion Exchangers                     | <input type="checkbox"/> 4486 Equipment for Treating Industrial Wastes |
| <input type="checkbox"/> 2204C Permutit® Precipitator                     | <input type="checkbox"/> 2357 Permutit Spray Deaerators                |
| <input type="checkbox"/> CS-105 Permutit Wisprofloc-20 Coagulant Aid      | <input type="checkbox"/> 4732 Permutit Tray Deaerators                 |

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

Water Comr. & Chief Engr., Philadelphia, Pa. Journal AWWA., October, 1960.

"Expansion of a Water Pumping Station in Australia." Australia is also experiencing an increase in water demand which is being met at the Ryde Pumping Station in Sydney. By J. Grindrod, New Milton, Hants, England. Water & Sewage Works, October, 1960.

"Supervisory Control System Unifies Five Well Stations." Orlando uses telemetering switching and report-back of pump operations to tie in its newly expanded well network. By L. L. Garrett, Manager, Water Department, Orlando Utilities Commission, and Charles A. Black, Vice President, Black & Associates, Consulting Engineers. Water Works Engineering, October, 1960.

"New Works for West Kent Main Sewerage Board." First stage of post-war drainage scheme completed at a cost of more than \$4 million. The Surveyor and Municipal and County Engineer, 17 September, 1960.

"When Planning a Water System Check Finances—and Engineering." Proposal for a distribution system to serve a rapidly growing suburb of Minneapolis led to a comparison survey of the quality and cost of three possible sources of water. By Fred G. Goff, Administrative Assistant, Orr-Schelen, Inc., Consulting Engineers. Water Works Engineering, September, 1960.

"Low-Temperature Liquid Lime Slaking at Howard Bend Treatment Plant." Report of tests to determine

whether lime could be slaked efficiently at low temperatures without the use of heat exchangers, with cold water, and with the temperature of the slaker controlled by the rate of flow of tap water to the tank. By William B. Schworm, Sr. Chem. Engr., St. Louis Water Div., Howard Bend Station, Chesterfield, Mo. Journal A.W.W.A., September, 1960.

"Filtres Rapides au Sable, avec Réglage par les Pompes, dans la Station de Traitement pour l'eau du Lac à Lachen (Suisse)." Rapid Sand Filters, with Adjustment Through Pumps in

the Water Treatment Station of the Lake of Lachen (Switzerland). par A. Gubelmann et F. Lipp. La Technique De L'Eau. 15 Aout, 1960.

"Nouvelle Méthode de Détermination de la Capacité d'Absorption en Terrains Perméables." A new method of determining the infiltration capacity of impermeable land. par A. Bouchardeau, Directeur de Recherches, et J. Rodier, Ingenieur en Chef à l'Electricité de France, Chef du Service Hydrologique, de L'Office de la Recherche Scientifique et Technique Outre-Mer. La Houille Blanche. Juillet-Aout, 1960.

## Streamlined Signal Davits in Texas



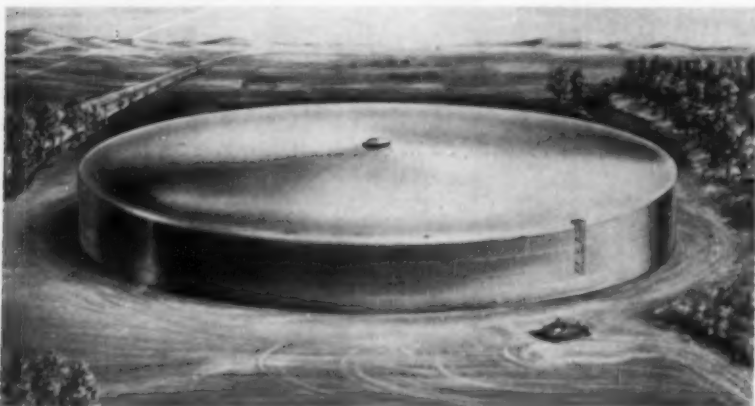
● NEW TRAFFIC signal installations at a busy intersection in Beaumont, Texas.

## Massive Water Storage Tank for a County

A 11,000,000 gallon all-steel water storage tank, said to be the second largest steel water tank in the nation, is being fabricated by Nooter Corporation, St. Louis, for the St. Louis Water Company. The reservoir diameter will be 240 feet.

Steel plates up to 1½ inches thick are pre-formed in the shops and

erected by field crews using an automatic welding process. About 1,120 tons of steel and more than 18 miles of welding will be required for the job. Work was started in June and completed by late fall. It is part of a \$5,000,000 expansion program for St. Louis County Water Company during 1960.



● ARTIST'S sketch shows appearance of 11 million gallon water storage tank.

NEW, streamlined traffic signal standards installed at the intersection of U. S. Routes 90 and 287 in Beaumont, Texas, combine strength with an attractive appearance. The new design, named the Classic, is in keeping with the trend to functional, streamlined styling. The structure has been tested for winds of hurricane velocity.

Installation and maintenance is simplified since the arm is easily slipped over the shaft and can be rotated to any point within a 360-degree circle. The traffic signal standard can be furnished with arms 10 to 25 feet long in aluminum and up to 35 feet long in steel; matching lighting standards with arms 4 to 10 feet long are available in both steel and aluminum. The Classic design is also available in an overhead sign structure with spans of 50 to 100 feet.

The signal standards shown above were sold to the Texas Highway Department through Signal Engineering Company of Houston. These structures have maximum length arms, 35 feet long; shafts are 13 feet tall. They are made from 11-gauge, low alloy high tensile steel. Some standards carry two signals.

# PACKAGE PLANT

## MEETS 10-STATE STANDARDS

**A** PACKAGE plant providing sewage treatment for developments, motels, factories, and similar areas not immediately reachable by a municipal sewage system and treatment plant has been announced by Link-Belt Co. This plant is designed to comply with the criteria established by the "10-State Standards," which have been adopted in whole or in part by more than half of the states.

The plant, which utilizes 2-stage biofiltration, is made in several sizes to serve up to 500 people. It is incorporated in a single structural unit, except that such auxiliary units as a pumping station, a comminutor, a flow meter and a chlorine contact tank are available separately where desired or required. These units, like the shell of the package plant, are of steel which is protected against corrosion by epoxy resin coatings and magnesium electrodes.

A full scale model, designed for 150 persons, has been in use on a 24-hour per day basis, fully loaded, for a year at the Link-Belt plant near Colmar, Pa. Average raw sewage contained 250 mg/L of BOD and 200-250 mg/L of suspended solids. In this protracted test, average effluents contained 30 mg/L of BOD and the same of suspended solids.

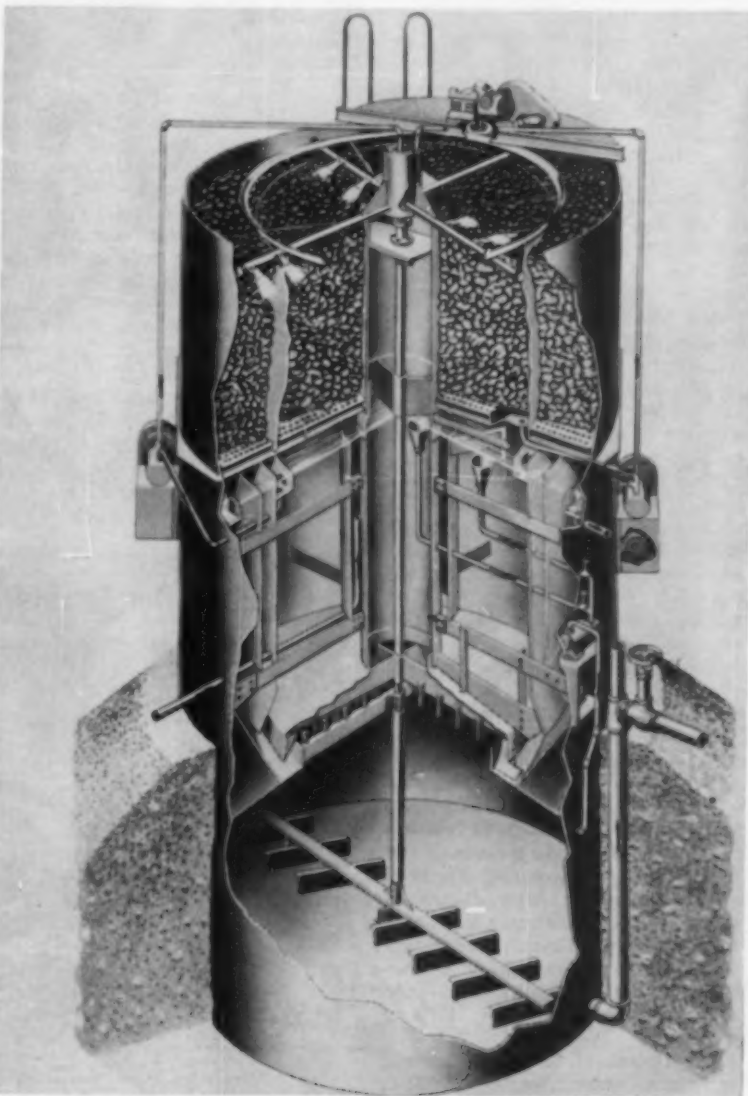
The design of the plant is interesting. Basically it is a 2-stage biofiltration unit with fixed volume recirculation of 1:1 in each stage. The primary settling tank, which has mechanical sludge collection, provides a surface loading of 600 to 800 gals/psf/day, with a side water depth of 7 ft. The organic loading on the filters ranges, in the different units, from 22 to 45 pounds per 1,000 cu. ft., or 0.6 to 1.2 pounds per cubic yard based on 35 percent BOD removal in the primary clarifier. The filter are 5 feet in depth and arranged annularly, with the secondary filter outside the primary. The volume of the two filters is essentially equal. The distributors are motor driven. Recirculation pumps are of positive displacement type and each has a capacity twice the design flow.

The secondary settling tank, which is placed around and outside of the primary, has a sidewater depth of 7 ft. and a surface loading

of 800 gals/psf/day. It also has mechanical sludge collection. The digestion compartment, which forms the bottom portion of the unit, is unheated and is designed to provide a minimum of 8 cu. ft. per capita based on 0.2 pound of dry solids per person per day. A mechanical scum breaker and a mechanical sludge mixer-collector are provided; also a clock controlled device to remove scum from the primary

settling compartment and from the gas vent of the digestion compartment.

Four motors are used; one drives all mechanical equipment, including the sludge collectors and the distributors; two are required for the recirculation pumps; and the fourth operates the scum pump. These are ½ horsepower on the lower size ranges; some are larger in the larger units.



● TWO-STAGE trickling filter package plant contains many interesting features.

# THE INDUSTRIAL WASTE DIGEST



Prepared by CLAYTON H. BILLINGS, Associate Editor

## Fruit Canning Waste Studies

The high concentration of fruit canning industries in the San Jose, Calif., area has been significantly related to the San Francisco Bay pollution problem for 30 years. The city sewage treatment plant of the primary type, which also serves Santa Clara and five other municipalities, receives wastes from 23 canneries. The seasonal operations are largely responsible for a high BOD, which averaged 920 mg/L during August, 1958. Suspended solids for the same period were held to 480 mg/L, by the use of preliminary fine screening at the canning plants. The city authorized a study to determine the capacity of the receiving water and the most appropriate secondary treatment for the combined sewage and industrial waste. For the study on treatment, bench-scale and pilot plant investigations were made of (a) anaerobic primary treatment and either activated sludge or high-rate filter, (b) sedimentation plus both single and two-stage high-rate filters and (c) activated sludge, both with and without primary sedimentation. The anaerobic fermentation process failed to remove sufficient BOD to warrant consideration. It was decided that high-rate filters would not be physically suitable for the large treatment works that eventually will be required for the San Jose metropolitan area. The activated sludge process, with primary sedimentation, sludge reaeration and peak load supplemental feed of ammonia gave a high degree of treatment with relatively low aeration detention times. Preliminary designs will be based on this process and will also consider the use of oxidation ponds for tertiary treatment.

"Treatment of Combined Sewage and Fruit Canning Wastes." By J. T. Norgaard and D. A. Reinsch of

Brown and Caldwell, San Francisco and R. Hicks, Metropolitan Drainage Board, Auckland, New Zealand. *Jour Water Pollution Control Fed.*, October, 1960.

## Low DO in Estuaries

Ocean water entering Grays Harbor, Washington, at flood tide was observed at times to contain abnormally low dissolved oxygen concentrations. These low values, less than 5.0 mg/L or 3.5 ml/L, were associated generally with lower than normal ocean water temperatures which presumably results from upwelling along the coast. On a given tidal cycle oxygen deficiency from normally assumed saturation levels for ocean water is equivalent to the oxygen demand associated with the domestic sewage discharge of 20 million persons. It appears that upwelling phenomena may negate conclusions based on oxygen balances in pollutional analyses of estuaries unless the actual dissolved oxygen

concentration at the ocean source is determined.

"Water Quality and Upwelling at Grays Harbor Entrance." By Erman A. Pearson and George A. Holt, University of California, and Grays Harbor Division, Rayonier Inc. *Limnology and Oceanography*, January, 1960.


## Water Re-use Saves \$200 Daily

In June, 1960, the Maytag Co. of Newton, Iowa, received an award from the Izaak Walton League of America for water conservation practices, embodying re-use and treatment of wastes. The manufacturing operations concerned are metal finishing, including pickling, phosphatizing, porcelain enameling and electroplating. Basically, the process engineering design and the treatment facilities provide for segregation of concentrated wastes, oxidation of cyanides, reduction of chromium, precipitation of heavy metals, centrifuge dewatering of

## Incinerator for Styrene Still Bottom Sludge



STILL bottom sludge, composed mainly of styrene wastes, is disposed of in an industrial incinerator made by Preenco Mfg. Co. In use by a midwestern firm, waste material is trucked to the incinerator in a trailer-mounted 1500-gal. heated storage tank. The mobile unit is complete with a pumping system and a 150-gal. flush-out tank for flushing lines with mineral spirits solvent. The heater raises the temperature of the sludge to 140°F, lowering the viscosity to permit it to be pumped. The incinerator is equipped with a blower, electrically driven by a 15-hp motor, for atomization of the heavy sludge. The high temperature of combustion minimizes air pollution.



## Clam Shells for Bedding and Backfill At New Orleans

These clam shells, dredged from the bottom of Lake Pontchartrain, made a good laying bed and a highly satisfactory backfill material on two new pipe lines that were laid in wet Louisiana clay.

The pipe was prestressed concrete steel-cylinder pipe, with flexible bottle-tight joints. The combination of steel and concrete provides exceptionally high strength, high flow coefficient and long life.

The longer line used 7500 feet of 54-inch pipe, and the line shown here used 4300 feet of 20-inch pipe.

The lines were planned and installed under the supervision of Edmond F. Hughes, general superintendent, J. E. Morrill, secretary, and John J. Porte, principal assistant engineer, all with the New Orleans Sewerage and Water Board. General contractor was Boh Brothers, New Orleans. The pipe was manufactured by Price Brothers Company at Hattiesburg, Miss.

**Price Brothers**  
CONCRETE PRESSURE PIPE

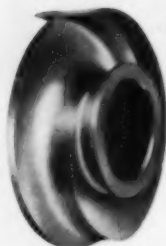
# AURORA CONTROLLED PERFORMANCE



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Typical applications: elevating sewage, pumping sludge, handling heavy settleable solids, effluent, and other wastes and industrial by-products.

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sludge and re-use of treated effluent for many of the metal finishing processes. About 60 percent of all water used at Plant 2 is reclaimed, resulting in a saving of 0.75 mgd representing \$200 per day.

"Industry Will Reuse Effluents in Future Wastes Economy Drive." By T. C. Hoppe, Black and Veatch. *Wastes Engineering*, October, 1960.

### Photo Industry Wastes Generate Power

The waste flow from the Kodak Park Works of Eastman Kodak Co. amounts to 20 mgd and has as dominant characteristics, foam and a varying pH. The character of the waste is influenced mainly by the paper and gelatin manufacturing processes. The treatment plant includes automatically raked bar screens, an aerated grit chamber and a flocculating clarifier. Vacuum filters are used for sludge dewatering. At present the sludge is buried in a landfill, but a drying and burning kiln is being installed for improved disposal of the solids. Between the grit removal and clarification steps the flow is directed to a penstock for a 125-ft. drop to a horizontal hydroelectric turbine, generating power to operate the plant. This contributes to handling the foaming problems by dissipating the energy in the waste flow. The design was determined after a 6-year study. The plant was completed in 1957 and has operated successfully since.

"Treating Photo-Industry Waste." By Harry Eustance, Eastman Kodak Co. *Industrial Water and Wastes*, October, 1960.

### Basins for Treating Acid Wastes

Design of basins for neutralizing acid wastes usually starts with laboratory determinations to establish the most efficient neutralizing agent, reaction time, flow characteristics, amount and character of sludge. The batch process is particularly suitable for waste volumes up to 0.1 mgd. Continuous flow design is applicable where reaction time is short, where reactions need not go to completion and where waste flows continue for 24 hours. Eighteen inches of freeboard should be provided and inlets and outlets arranged to minimize short circuiting. The latter can also be helped by division of a tank into a series of cells by baffling. The basins may be constructed of many materials, as long as adequate consideration is given to protective coatings or linings. Brick with plastic type cements for jointing have

## THE FACTS ABOUT FRESH SOLIDS DEWATERING

### ...SLUDGE CONDITIONING

Successful fresh solids dewatering depends upon proper chemical conditioning to produce the most filterable sludge, comparatively low in bacterial count and free from nuisance in disposal.

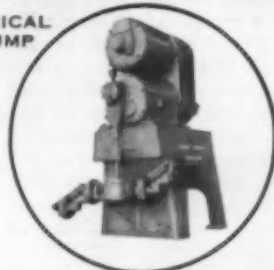
The functions of chemical conditioning are to achieve maximum coagulation, with minimum chemical usage. The chemical feed must be co-ordinated to the sludge flow and the chemicals must be adequately mixed with the sludge to provide optimum filtration rate. Komline-Sanderson has developed and installed over 250 K-S Lime Slurry pumps to feed slurry to Coilfilters. The K-S Chemical Feed pump handles ferric chloride successfully, positively, with assured long life. Both pumps are of dual valve design.

Proper mixing involves intimate contact with the sludge, realizing that the viscosity and solids content change during the filter run. Gentle agitation during a controlled detention period is provided by the new stainless steel Komline-Sanderson Rotating Conditioning Tank with variable speed drive—result—proper mixing of chemicals with the sludge.

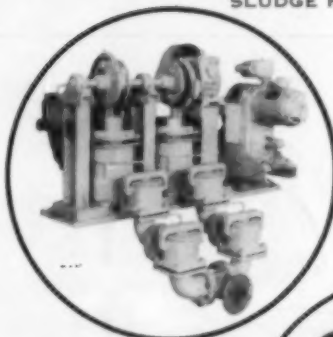
Proved Komline-Sanderson Sludge Pumps, ruggedly constructed, with dual valve design, are installed with all Coilfilters to provide positive pumping of sludge.

Komline-Sanderson chemical feeders, sludge pumps and rotating sludge conditioning tanks are designed to perform as an integrated team. When coupled with a non-clog, non-blind COILFILTER, the success of the fresh solids dewatering installation is assured. You can depend on Komline-Sanderson equipment, by far the most widely used in fresh solids dewatering sewage treatment plants.

K-S CHEMICAL  
FEED PUMP



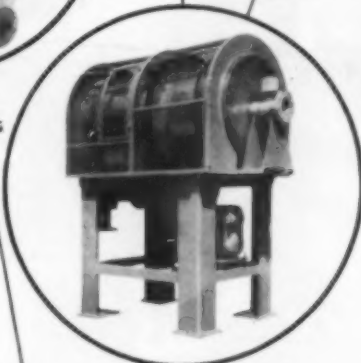
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SLUDGE PUMP



K-S LIME SLURRY  
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CONDITIONING  
TANK



K-S COILFILTERS



**KOMLINE-SANDERSON ENGINEERING CORPORATION**  
PEAPACK, NEW JERSEY • BRAMPTON, ONTARIO, CANADA

been used. Coatings may consist of rubber, vinyl, Saran, polyethylene or resinous compounds. Chemically resistant piping and valves should be selected. Plastic, rubber, glass, porcelain, fused silica, stainless steel and special iron alloys may be appropriate. Agitation is necessary to assure proper contact between the wastes and neutralizing agent. This may be accomplished by slow speed paddles, propeller type turbines or diffused air.

"Design of Neutralization Basins for Acid Wastes." By John Baffa, Consulting Engineer. *Industrial Water and Wastes*, October, 1960.

## State-Wide Air Pollution Survey.

As a result of the passage of a state air pollution control act, an area survey is being used by the New York State Health Department to determine types, extent and severity of air contamination. Necessary local or regional rules and regulations will result from the findings. The survey will not be based on sampling, but emission estimates are obtained from quantitative data on fuel consumption, refuse incineration and industrial processing. Estimates are based on

emission values reported for similar operations and activities in published technical literature. Contaminants are classified by type, amount, source category and community of origin. Existing meteorological records and topographical information are analyzed to ascertain important influences on each area's air pollution. Effects are determined from past studies, field observations, citizens interviews and opinions of qualified personnel. In the Greater Elmira pilot study, computations of contaminant concentrations agreed favorably with available sampling results. Publicity before, during, and following surveys is being used to inform citizens of the purpose, progress, and findings.

"Comprehensive Area Surveys in New York State." By C. S. Maneri, New York State Health Dept. and W. H. Megonnell, Public Health Service. *Jour. Air Pollution Control Assoc.*, October, 1960.

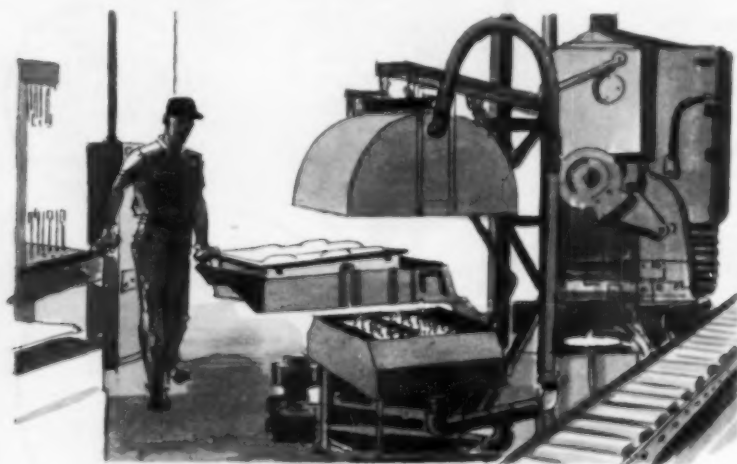
## Other Articles

"Rapid Modification of the Pyridine-Benzidine Method for Cyanide." By Myron Brin, State University of New York. Chloroform is substituted for n-butyl alcohol as a solvent avoiding the time-consuming process of solvent transfer for colorimetric analysis. *Jour. Water Pollution Control Fed.*, October, 1960.

"Incineration of an Aluminum Chloride Complex." By Joseph B. Kay, Preenco Mfg. Co. Applicable for waste disposal in any polybutane production operation, an upfired retort was designed to use natural gas as an auxiliary fuel to raise temperatures to 3000°F for thorough volatilization. *Industrial Water and Wastes*, October, 1960.

"Safe Discharge of Low-Level Nuclear Wastes to Surface Waters." By J. A. Lieberman and D. C. Costello, Jr., Environmental and Sanitary Engineering Branch, Atomic Energy Commission. According to some nuclear energy growth estimates, radioactivity accumulations could exceed by 1960 available air and water dilution for disposal into the environment. Therefore, other methods must be employed. *Wastes Engineering*, September, 1960.

"Public Relations and Industrial Wastes." By Lloyd Stackhouse, Cole and Weber, Inc. To woo the public about industrial wastes problems we have to break the habit of looking back in anger to yesteryear when natural resources were untouched. *Journal Water Pollution Control Federation*, September, 1960.



## The M & H Spirit

There are those who might believe that a valve is just a valve. They might say: "What's in a name? All valves are made of about the same iron and bronze — so what?"

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(No. 7 of a Series)

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## 4-Inch Rainfall in Dallas

According to a newspaper report on July 14, Dallas, Tex., had 4 inches of rain in two hours.



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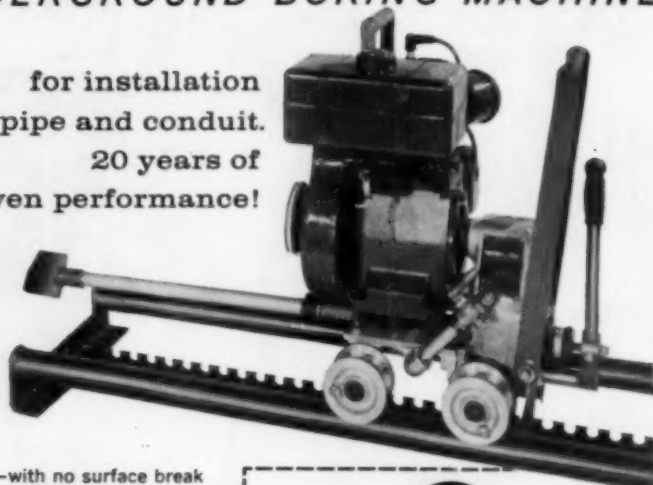
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### City-County Subdivisions

Gainesville and Hall County, Georgia, both recently enacted land subdivision regulations establishing minimum design standards for lots, streets, and alleys. While the regulations are not identical, they were prepared with a view toward some degree of coordination. The regulations were prepared by a citizens' committee on subdivision regulations appointed jointly by the city and the county. The committee spent more than a year preparing the regulations. The city adopted its rules in January, while the county acted in July. The city's regulations are more stringent than those adopted by the county in respect to lot sizes and street design standards. Even before the county adopted the subdivision regulations, some of its provisions relating to the design and installation of septic systems had been established by resolution of the county board of health. The Gainesville-Hall County Planning Commission will administer the regulations adopted by both local governments.—Public Management.

• • •

### Community Facilities for Subdivisions

(Continued from page 78)

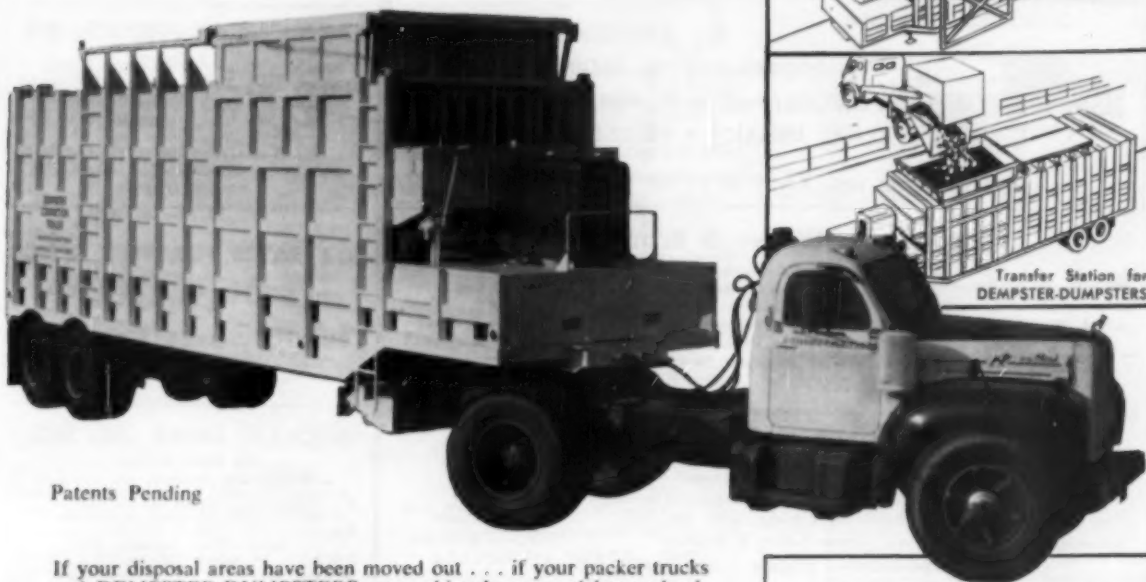
remainder of the cost, plus the cost of all oversize facilities.

The policies adopted by the City of Fort Worth for installation of community facilities provide for a substantially reduced city participation in costs of facilities and improve the standards required for several of the facilities. The policies were adopted because under the test of careful examination they were justified as being fair to both new and old areas of the city. In presentation of the new policies, it was emphasized that the alternative to reduced city cost participation in necessary community facilities was higher taxes and/or water and sewer rates. Emphasis was placed on the fact that the policies would result in the development of neighborhoods of a better quality due to the improved standards provided. Although it was recognized that there would be a higher cost to developers—which presumably would be passed on to home buyers—it was felt that the cost increase to the home buyer was insignificant when compared to the neighborhood improvement obtained.

Complete research by the Public  
(Turn to page 158)

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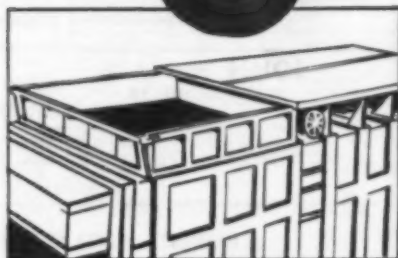
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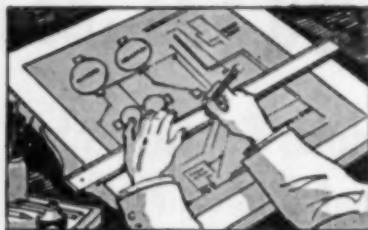
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(Continued from page 154)

Works and Water Departments, which have responsibility for installation and maintenance of the facilities under study, was the deciding factor in the successful presentation of the policies recommended. By anticipating questions and objections in regard to application of the policies, many of the analyses requested were ready in advance.

One facet of the research that was of particular assistance was development of a hypothetical subdivision, and the application of both existing and proposed policies for installation of community facilities to that subdivision. The report was helpful in presenting the engineering specifications and criteria in laymen's language and in placing cost changes in the proper context. This concrete example of the application of the proposed policies gave emphasis to the fact that the cost increases involved, especially when included in a long-term mortgage and evaluated in terms of a monthly payment, were quite small in comparison to benefits derived through better standards and a more stable future city tax picture.

The hypothetical subdivision, reflecting a typical situation insofar as possible, assumed a development of 66 acres, with 274 lots. The study showed that the total cost of development per lot would have been \$1,423 under previous policies, and \$1,644 under the policies adopted by the city council. In this typical situation, the new policies have the effect of increasing developers' costs by approximately \$415 per lot. The developer's share of the cost of providing community facilities in the hypothetical subdivision would be \$1,183, while the city would bear \$461 of the expense. The city's share of 28 percent compares to the 46 percent share the city carried under previous policies.

The increased cost to the home buyer assuming that the entire added cost were passed on to the buyer, would be approximately \$2.50 per month on a 30-year loan at 6 percent interest. In return the buyer receives substantially better street pavements, an excellent street lighting system, improved storm drains and assurance of a smaller tax load than would otherwise be possible in future years.

**Unexplored Areas**

While the policies adopted by the City of Fort Worth represent a significant advance in handling the new facilities problem in Fort Worth, certain aspects will receive

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further study and probable modification. An important item deserving more attention is the distribution of the cost of oversize facilities that serve a larger area than the immediate subdivision. The adopted policies reflect only slightly the benefit received by future developers from such oversize facilities which, generally speaking, are now paid for by the city. Through a tap charge, per-acre fee, proration of cost based on the portion of the capacity of the facility used, or some other means, a method should be developed to divide the costs of oversize facilities more equitably between the immediate developer, the city, and future developers. Such a refinement of the cost distribution, when perfected, may permit a reduced cost for the first developer involved.

Exploration of the most equitable means of providing and paying for such facilities as street name signs, neighborhood recreational areas and elementary school sites, is being conducted by a number of cities. Pioneering municipalities are now making provisions for developer participation in such facilities, with considerable justification when these facilities are designed for and used by the specific area in question. Another area now being investigated by a few rapidly-growing cities is developer participation in costs of plant expansion of water and sewer systems which is necessary due to the demands of newly-developed areas. While this problem requires a very detailed analysis before the final answer can be developed, it is an area that will receive further attention if financial problems of cities become more severe in the years ahead.

**Summary**

Growth, much desired and an economic blessing when properly guided, has created for many cities a monster in the requirements for planning, engineering, and financing the very community facilities that make the difference between rural and urban living. As these problems become better understood, the trend for many cities is to improve engineering standards and specifications for community facilities and to provide for a distribution of their costs between developers and cities consistent with benefits received. Adoption of reasonable policies based on this approach are essential if cities are to continue as desirable residential areas, with minimum tax payments required of their citizens.

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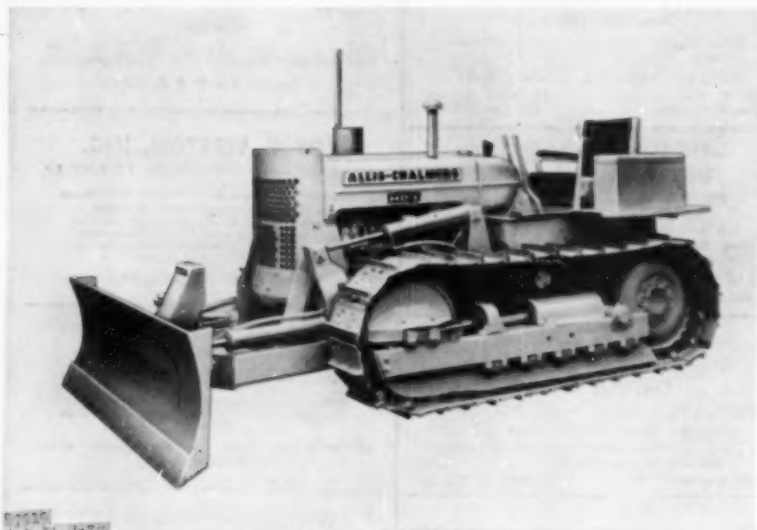
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## PUBLIC WORKS EQUIPMENT NEWS



### Utility Tractor

The D-15 Utility wheel tractor and the H-3 and HD-3 Utility crawler tractors are designed with a wide range of matching equipment for construction, industrial, materials handling and maintenance applications. Manufacturer's rating of the D-15 is 48 hp. It features a heavy duty, non-adjustable front axle and 24-in. rear wheels. The H-3, powered by a 43 hp. gasoline engine, and the HD-3, featuring a 40 hp. diesel engine, are both in the 6,000 lb. weight classification.

The D-15 and H-3 and HD-3 tractors feature Allis-Chalmers exclusive "Shuttle Clutch" which provides intermediate precision level control of the tractor's power and

speed, forward or reverse, without any foot clutching or gear shifting. All six tractors in the Utility line have been designed with a low profile for stability and also with high clearance for maneuverability.

A line of 42 pieces of matched Utility equipment with the 1961 Utility tractors features various sizes and capacities of loaders, backhoes, mowers, fork lifts, bulldozers, and other such utility tools as scoops, snow plows, sweepers, subsoilers, scarifiers, pipeline and logging equipment.

Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin.

Circle No. 12-1 on the convenient reply card facing page 34.

### Sludge Reader

The Komline-Sanderson Sludge Reader assures maintaining proper sludge consistencies. Utilizing harmless nuclear energy, the Sludge Reader will react to changes in solids concentrations passing through the line and at a predetermined level, controls the sludge pump. For instance, if it is desired to pump only sludge having a consistency of 4 percent or more from a clarifier, the Sludge Reader is set to stop the plunger pump when the

sludge consistency gets below 4 percent and restart the pump and keep it running when the sludge consistency reaches and maintains 4 percent or more. When the Sludge Reader stops the pump, an adjustable timer (zero to 60 minutes) takes over. At the end of a preset time, the pump starts again, minus the control of the Sludge Reader. When the line is cleared the Sludge Reader takes over once again. Accurate, continuous and permanent readings are presented on the large panel meter and the chart recorder.

In pumping sludge from a clarifier to a digester or to a dewatering device, the Sludge Reader can improve the plant operating efficiency. In new installations it permits the use of smaller pumps, single pump operation from several tanks and a reduction of plant labor requirements.

Komline-Sanderson Engineering Corp., Peapack, N. J.

Circle No. 12-2 on the convenient reply card facing page 34.

### Broom Core Kit

A kit for rebuilding worn out, discarded rotary broom cores consists of a 16-gauge steel spiral weighing about 50 lbs. crated. It is available in 10 in. and 12 in. I.D. standard sizes and in any length, to fit most popular makes of cores such as Rynal, Danline, Mobile, Wayne, Elgin, Austin - Western, Hough and many others.

Regardless of the type cores to be rebuilt, whether wooden, rubber or steel, the Ben-Ko Spiral simply has to be slipped over the old steel housing and welded into position. For wooden cores, angle irons, or flat bars or tubing need to be bolted to the steel housing, cable and hold down plate added. No staples are required.

With the Spiral spot-welded into position the core has a completely new surface ready for re-fibering with any material such as Palmyra, Hickory, Calibar, Spring Steel Wire, "Permene" or "Tynex" Nylon. The rebuilt cores can be refibered on an automatic machine such as the Ben-Ko-Matic, or with a hand winding machine.



Ben-Ko-Matic, Inc., 8028 N. Jersey St., Portland 3, Oregon.

Circle No. 12-3 on the convenient reply card facing page 34.

## Core Indicator



A versatile measuring indicator for quickly and accurately determining the length and diameter of drilled concrete cores to be used for testing is designed to enable highway and construction engineers to check cores rapidly and with consistently accurate results.

The indicator has an indexing rotary table on which 4 or 6 in. diameter concrete cores are placed. This table locks into eight positions for measuring the core length up to 12 in. It also locates the two positions required for diameter measurements. The dial indicators also lock in proper measurement position.

The portion of the indicator for measurement of diameter is detachable, thus making two independent measuring units for diameter and length. The diameter and length measurements are made in accordance with the specifications of the American Association of State Highway Officials (AASHTO) T-24 and T-148 and American Society for Testing Materials (ASTM) C-42 and C-174.

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

Circle No. 12-4 on the convenient reply card facing page 34.

## Radar Detector

The Radar Vehicle Detector, Model RD-2, offers a means of non-directional vehicle detection. Mounted over the roadway, the RD-2 beams microwaves downward onto the pavement somewhat like an invisible spotlight. Vehicles need only to move through the beam to reflect some of the microwaves back to the detector, thereby producing an actuation. Vehicles of all reflective curvatures will cause an actuation, yet, pedestrians, parked cars, and extraneous noises will not. The beam width is adjustable so that

one detector may cover one, two or three lanes.

The RD-2 is supported over the roadway by conventional luminaire-type mast arm or rigid 2-wire span. Both methods make it a simple and economical matter to relocate the detector to meet future roadway changes.

Vertical clearance from the roadway may be within a range of 14' 6" to 17'. Distance from the stop line is governed by average approach speeds, type of controller, and roadway characteristics.

Automatic Signal Div., Eastern Industries, Inc., Norwalk, Conn.

Circle No. 12-5 on the convenient reply card facing page 34.

## Chlorinator

A wall-mounted chlorinator, 3600 series, has been developed for use in municipal and industrial water and waste treatment facilities and in large municipal swimming pools.

The feature of the chlorinator is the safety stack regulator within which all control components are housed. Features of the design are: A shut-off valve, sealing the chlorine supply from the chlorinator during inoperative periods; an isolating valve, which seals tight the functional parts of the safety stack and prevents even traces of water from entering the chlorinator due to ejector back pressure; and a differential pressure regulator to maintain stable chlorine gas feed.

This manually-operated chlorinator can maintain an accuracy of  $\pm 2$  percent of feed rate over a 20-to-1 range in flow. A simple snap-in flowmeter tube allows capacity changes from 3 to 200 pounds of chlorine gas per day, without the use of tools.

Fischer & Porter Company, 670 Jacksonville Rd., Warminster, Pa.

Circle No. 12-6 on the convenient reply card facing page 34.



## Copier-Projector



A new visual communications system, which enables a plastic transparency to be made from almost any document in less than ten seconds in normal light and projected immediately in a fully-lighted room, combines the use of a copying machine and an overhead projector. Making of transparencies is a simple operation. Transparency and original document are inserted in a "Thermo-Fax" copying machine and the image is made in about four seconds.

The "Thermo-Fax" overhead projector weighs 40 lbs., uses regular 110-volt current, a 1,000-watt lamp for maximum brilliance, and is operated by a single switch. It projects a 10 x 10-ft. image from a distance of 15 ft. The new system is expected to find wide acceptance, especially for planning and employee training sessions where visual communications are more effective.

Minnesota Mining and Manufacturing Co., Dept. SO-409, 900 Bush Ave., St. Paul 6, Minn.

Circle No. 12-7 on the convenient reply card facing page 34.

## Curing Agent

Development quantities of a CIBA curing agent for epoxy coating systems are now available for evaluation. According to CIBA, the new curing agent, Araldite DP-121, offers a longer pot life than other low-viscosity curing agents that have been used in solventless systems up to this time; it can be cured 2-3 days after mixing with conventional liquid epoxy resins. Films of 5-10 mils can be applied in a single spray coat, resulting in hard, tough, flexible films possessing good chemical resistance.

CIBA Products Corp., Fair Lawn, N. J.

Circle No. 12-8 on the convenient reply card facing page 34.



## Bituminous Finisher

The Smith Mark IV Finisher with over 400-ton per hour capacity, is mounted on rubber tires with paving speeds up to 102 feet per minute and traveling speeds up to 10 mph. This, combined with unique front and rear wheel steering provides exceptional maneuverability and ease of handling.

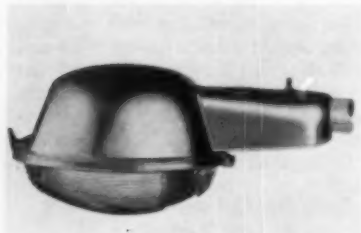
Additional features include: Swept back screed for fast, even distribution of the mix; a swinging operator's platform for unobstructed visibility to right and left; extra flotation with large pneumatic tires; and folding side wings on the hopper to permit trucks of all sizes to unload mix without spillage yet move the entire load to the conveyor without hand shoveling or prodding.

The T. L. Smith Company, 2835 North 32nd St., Milwaukee, Wis.  
Circle No. 12-9 on the convenient reply card facing page 34.

## Luminaire

The 2500 Series "Urbanova" end-mounting street lighting luminaire for residential areas or secondary streets where uniform, low-level lighting is desired, is designed for 100, 175, or 250-watt mercury lamps or incandescent lamps up to 4,000 lumens. A choice of two Revere-Corning Pyrex refractors provides A.S.A.-I.E.S. Type II or Type II-4-way distribution pattern with clear lamps, or Type III or 4-way distribution with phosphor-coated mercury lamps. The Revere Urbanova is available with choice of 1 1/4" or 2" slipfitter.

Revere Electric Mfg. Co., 7420 Lehigh Ave., Chicago 48, Ill.  
Circle No. 12-10 on the convenient reply card facing page 34.



## End-Loader

This 3000-lb. capacity end loader features maximum visibility and maneuverability. Where loading operations require a unit with short turning radius, maximum traction and general off-the-highway versatility, the 44-35 Tractor Loader combination is able to operate in mud, snow, sand and all adverse ground conditions. Operating features include self-levelling bucket, positive double-acting hydraulics, vane type pump, 42 in. reach, maximum dump angle 48 degrees with 8 ft. under the bucket lip. Roll back at ground level 32 degrees. 10.00 x 24 8 ply tires are standard.



Added to line of all-wheel-drive 49 horsepower tractors and attachments.

Bucket sizes are available other than the standard 3/4 cu. yd. materials bucket. Attachments also available include backfill blade, snow blower and snow blades.

Detroit Tractor Ltd., 1221 E. Keating Ave., Muskegon, Mich.  
Circle No. 12-11 on the convenient reply card facing page 34.

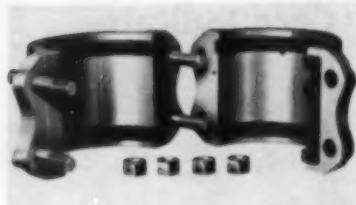
## Pipe Cutter



Cut 16" cast iron pipe in 33 seconds.

The new "Super" hydraulic pipe cutter, designed for use on 10" through 20" diameter cast iron water main employs the familiar Wheeler "squeeze and pop" principle. No accessory equipment is required. The unit is readily installed on the pipe by two men and quickly cut by one man.

The Wheeler Manufacturing Corp., Ashtabula, Ohio.  
Circle No. 12-12 on the convenient reply card facing page 34.



## Split Sleeve

The F-1202 ductile iron split repair sleeve permits permanent repair of 4", 6" and 8" transverse cast iron pipe underground breaks. The assembled 4" diameter sleeve weighs 26 lbs.; the 6" sleeve 34 lbs.; the 8" 44 lbs. Effective length is 4 in. between end seals on all sizes; overall length is 6 1/4"; there are no end glands. Side and end gaskets are pre-assembled and cemented in sleeve grooves. All parts are high tensile and corrosion-resistant. Sleeve halves are 70,000 psi tensile ductile iron. Nuts and bolts are high strength, corrosion-resistant alloy. Once the damaged pipe is uncovered, one half of the sleeve is placed on each side of the pipe. Sleeve halves are drawn together. Pre-assembled rubber gaskets make tight seal. After the bolts are taken up finger-tight, tightening the four bolts completes the assembly.

James B. Clow & Sons, Inc., 201-299 North Talman Ave., Chicago 80, Illinois.

Circle No. 12-13 on the convenient reply card facing page 34.

## Crawler Trencher

The Ditch Witch crawler trencher is an ideal machine for digging in rocky or frosty soil condition. The crawler is available in either 9 or 12 hp. models. The crawler machine features a jaw clutch mechanism for ease in steering and maneuvering. It gives a straight trench, fast digging and economical operation.

Witch Marketing Co., 1959 West Fir Ave., Perry, Okla.

Circle No. 12-14 on the convenient reply card facing page 34.



## Utility Pump

This multi-stage pump is available in both electric and gasoline-powered models. Both models incorporate the Barnes Sabre-Jet design. Construction of the pumps makes them desirable for general purpose applications requiring high head performance. These pumps deliver up to 3200 gph and pressure up to 60 psi.

Quad volute assure quick and positive self-priming. Both pumps have compact, heavy-duty close-coupled capacitor motor or engine, the former electric, the latter gasoline-driven. On Models 162U and 162UG, the suction is tapped for 1 1/4-inch pipe and a bronze check valve is supplied with both the gasoline and the electric models. Hose adapters for every conceivable use are available in an accessory package.

Barnes Manufacturing Co., Mansfield, Ohio.

Circle No. 12-15 on the convenient reply card facing page 34.



Compact, lightweight, base-mounted.

## Sewage Filter

A custom fabricated compact trickling filter for waste treatment uses the controlled waste volume and air application system developed by William T. Ingram. Enclosed in an aluminum shell, filter media are arranged in vertical sections with compressed air applied at the bottom of each section and settled sewage to the surface of each. The number of sections and area of each are varied according to organic loading required. A 4-sq. ft., 24-in. high filter is indicated as sufficient trickling filter volume for 600 people. For 2,500, a unit 64 sq. ft. by 24 ft. high is recommended. The units are factory assembled and shipped ready to operate.

Project Fabrication Corp., 112-20 14th Ave., College Point 56, N. Y.

Circle No. 12-16 on the convenient reply card facing page 34.

## Slope Grader



The Model U-16 Grade-More slope grader with hydraulically-controlled heel movement permits a light touch on the hydraulic controls to move the heel of the 16-foot moldboard up and down, as well as in and out from the side of the motor grader. The operator can make continuing adjustments, to fit constantly varying conditions, while the motor grader is in motion. Another hydraulic control moves the blade to the degree of slope required. The grader is well suited for

finishing slopes and shoulder lines, reconditioning old roads, removing heavy brush and weeds, cleaning ditches and retrieving gravel. It can be used simultaneously with the motor grader blade to provide a 24' blading width or to work on slope and top. The U-16 is equipped with an independent, self-contained hydraulic system.

Hasselbalch & Sons, 1112 Capitol Ave., Omaha, Nebraska.

Circle No. 12-17 on the convenient reply card facing page 34.

## Gauge System

The Nuclear-Chicago d/M-Gauge is a modern system of portable instruments for the fast, accurate, in-place measurement of moisture and density of soil and related construction materials. The complete system consists of an electronic readout unit (scaler) and four separate gauges to provide readings of (a) surface moisture (b) surface density (c) depth moisture and (d) depth density.

The surface gauges provide an answer for field compaction control on soil or aggregate fills and for non-destructive testing of concrete, asphalt, and related construction materials. The depth gauges are inserted into bore holes to measure the moisture and density at selected depths down to 200 feet below the surface. They permit the evaluation of in-place subsurface conditions accurately and inexpensively. They are used in pre-construction evaluation, in dam construction and in the determination of soil support.

Nuclear-Chicago Corp., 333 East Howard Ave., Des Plaines, Ill.

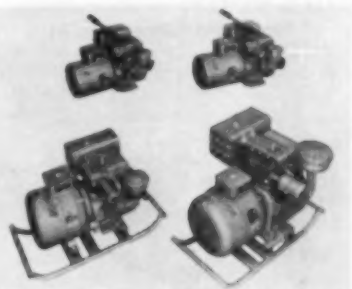
Circle No. 12-18 on the convenient reply card facing page 34.

## Portable Generator

Sixty-cycle generators range in watt rating from 1000 to 3500. They are single phase, 115 volt, AC generators with two outlets. A pilot light socket can be used as an additional outlet. The 2500 watt, 180 cycle generator has two 230 Volt, 3 phase outlets and two 115 Volt D. C. outlets. It features an automatic gas saver that idles the engine when tools are not in use.

Champion Manufacturing Co., 3700 Forest Park Ave., St. Louis 8, Missouri.

Circle No. 12-19 on the convenient reply card facing page 34.



60 and 180 cycle portable electric generators increase company's line.



## Pipe Thawer

With the 79x7 attachment for the Trindl Thermo-O-Tron Pipe Thawer you can perform additional operations such as soldering sheet metal seams in duct work, down spouts, gutters, and other sheet metal work; sweating of copper tubing and pipe; soldering-preheating-brazing.

For thawing out frozen water lines, the Trindl Thermo-O-Tron avoids the necessity of tearing up floors, walls, or digging up frozen ground. Plugs into any electric outlet.

Trindl Products, Ltd., Dept. 19 PT, 1807 S. Clark St., Chicago 16, Illinois.

Circle No. 12-20 on the convenient reply card facing page 34.

## Boring Machine

The "HCBMS" hydraulic digger digs holes 42 inches in diameter to a depth of 35 ft. All-way hydraulic or mechanical power leveling allows wide range of digging angles. All controls readily accessible from comfortable pivot seat. This unit features versatile winch properly aligned, accessible hand shift, full-swivel swivel seat, adjustable clutch, accessible foot clutch, and hydraulic controls.

Power access outlets for portable tools—"Generac" 110-220 volt outlets for electrical power tools. This unit is mounted on powerful swing or spotter base mounts featuring hydraulic stabilizers.

Highway Trailer Utility Division, Stoughton, Wisconsin.

Circle No. 12-21 on the convenient reply card facing page 34.



## Portable Heater

Both the large model, PH 350, and the small unit, PH 80 portable heaters, are designed for use in buildings under construction, portable heating for plumbing and heating roughing-in or repair jobs, warehouse heating, concrete curing and drying, warming, drying and thawing materials, pre-heating engines, drying crops and for other temporary or emergency heating jobs.

The PH 350 and PH 80 need no vents and are equipped with exclusive fold-back stainless steel combustion chambers to assure complete combustion and to eliminate odor, smoke and visible flame. They burn kerosene, No. 1 or No. 2 Diesel or fuel oil. A Sirocco-type blower provides positive air flow. Clean, smoke and odor-free shut-off is insured by 3-way clean shut-off valve. Model 350 with its output of 350,000 BTU per hour, is ideal for peak heating demand on heavy duty



jobs and can be operated continuously for 16 hours. Compact Model 80 delivers 80,000 BTU per hour for 20 hours on one tank of fuel.

John Wood Company, Heater and Tank Div., Conshohocken, Pa.

Circle No. 12-22 on the convenient reply card facing page 34.

## Infrared Detector

An infrared traffic detector, designed for quick installation and easy mobility from one location to another, is the Traffitol Detector. This offers wide flexibility to traffic engineers in studying and controlling traffic. It can be connected with all types of existing traffic control boxes and central computers to actuate semaphores in accordance with traffic flow. The use of infrared techniques makes the device highly accurate, and able to detect and count cars traveling up to 80 mph. Measuring only 8½ by 8½ by 9 in. and weighing 18 lbs., the detector can be mounted on utility poles, sides of buildings or any other convenient locations up to 50



ft. from the roadway. It is positioned so that an infrared beam projects downward onto the traffic lane or lanes. The beam is reflected from the pavement back into a receiver lens. When vehicles break the beam, they are detected and counted. The unit will operate on asphalt, concrete, gravel or dirt roadways.

Minneapolis-Honeywell, Heiland Div., 5200 East Evans Ave., Denver 22, Colo.

Circle No. 12-23 on the convenient reply card facing page 34.

## Valve Operator

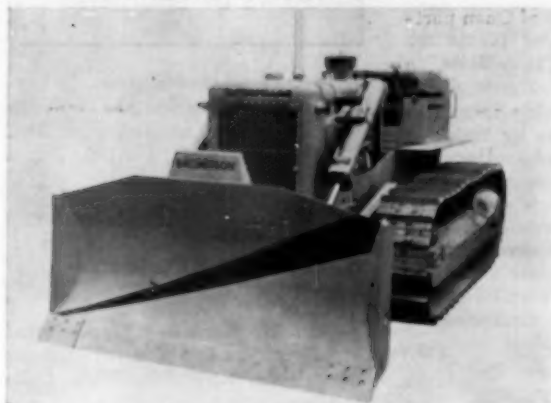
The portable Pow-R-Drive, for opening and closing valves, weighs only 38 lbs. and is handled by one man. Quick reverse air or electric drive motors make short work of "freeing up" valve stems; it rotates at 20 rpm, in either direction. A long torque arm handle acts like a wrench to break valves loose or seat completely. A safety stop control on both air and electric drives will shut off the drive if necessary. The unit also operates hand winches, powers a geared die head for threading or cutting, drills horizontal or vertical holes with an auger, drills anode holes and post holes, operates sluice gates and operates pipe tapping machines.

The E. H. Wachs Co., 1525 North Dayton St., Chicago 22, Ill.

Circle No. 12-24 on the convenient reply card facing page 34.



## Inside Dozer



For dozing jobs that require a minimum width blade, this Model BD16 dozer for the Cat D6B tractor is available in two styles; the regular blade with vertical cutting edges on the end plates, and the logging blade with completely open ends. Either type blade is eight feet wide which gives legal and safe transportability.

Push arms of the BD16 dozer extend between the tracks and the tractor engine, attaching to Cat ball-type trunnions that are welded to heavy steel brackets. These trun-

nion brackets bolt on each side of the main frame of the tractor to give plenty of raise and dig for both cable and hydraulic controlled blades. The tracks are free to oscillate while the blade stays level with the tractor.

Special applications include oil field work, logging, telephone line work and all-round contracting jobs that require considerable moving from one job to another.

Balderson, Inc., Wamego, Kans.  
Circle No. 12-25 on the convenient reply card facing page 34.

## Crane Carrier



The carrier, designated as the Model 406 and designed for mounting of the 11-ton capacity Model T-350 Bantam upper unit, offers maximum stability for long boom, big reach crane jobs. Standard features of the Model 406 6x6 Bantam carrier include a 220 hp V-8 gas engine, air brakes on all wheels, 9.00 x 20, 10-ply tires, and power steering.

Schild Bantam Co., Waverly, Ia. Ask for Bulletin #A-303.  
Circle No. 12-26 on the convenient reply card facing page 34.

## Hydro Trencher

A 9/16-yd. hydraulic trencher for exclusive use on the Oliver "880" Industrial Wheel Tractor designated the Ware "800" Hydro Trencher, has an uninterrupted arc swing of 180 degrees, breakaway capacity of 10,400 pounds, and maximum digging reach of 21 ft., 11 in. The machine is supplied with or without cab.

The Model "800" features full-vision operator positioning, multi-speed control of boom and dipperstick, power-locked stabilizers, new camel-back design of boom, straight-in-line cylinder power, hydromatic control of all boom operations, and many other new or improved features.

Oliver Corp., 1420 Mayflower St., Harrisburg, Pa.

Circle No. 12-27 on the convenient reply card facing page 34.

## Lamp Lighter

The Lamplighter (Series 15,000), a photoelectric lighting control, has an injection molded plastic cover and base to provide high dielectric strength. A series of exterior ridges makes handling easier and facilitates installation, while a twist-

lock base, conforming to EEL-NEMA standards, fits all standard receptacles.

Although a non-fused model is available, Lamplighter offers free



protection in case of overloading. Protection against surges from both the line and the load is provided; in addition, the components are protected against lesser surges by a gas lighting arrester built into the Series 15,000 control.

The light level, adjustable externally from the base, can be set from one foot-candle to 10 foot-candles, depending upon the user's requirements. To prevent turn-off

from light sources such as lightning and automobile headlights, the control has a time delay feature. Should the control fail, the light will remain on. Accessory mountings for adapting the new control to existing receptacles are also available.

The Acme Wire Co., Utility Products Div., New Haven 14, Conn.  
Circle No. 12-28 on the convenient reply card facing page 34.

## Highway Divider

The dividers (sometimes called jiggle bars) are extruded from a special butyl polymer compound impregnated throughout with federal yellow. The compound is made to withstand years of abrasion and is highly weather resistant. The standard units weigh approximately 11 pounds each.

The material can be supplied in stock lengths (16') with sufficient anchoring material to give the user the opportunity of cutting the material to fit his needs. The divider can be removed and re-used and will not damage snow plows if accidentally struck.

Pylacon, Inc., 48 N. Westwood Ave., Toledo 7, Ohio.

Circle No. 12-29 on the convenient reply card facing page 34.

## Fastening Kit



The Shure-Set fastening kit, designated Model R-550, contains one Shure-Set tool, one Shure-Drive shock-absorbing hammer, 50 drive pins, 50 threaded studs and a metal carrying case. With the kit, electricians, carpenters, plumbers and other craftsmen can perform over 100 different fastening jobs, setting studs into thin steel or concrete with a couple of hammer blows.

Ramset, Winchester-Western Div., Olin Mathieson Chemical Corp., New Haven, Conn.

Circle No. 12-30 on the convenient reply card facing page 34.

## Folding Steps



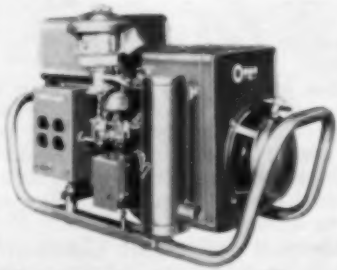
Truk-Step is mounted easily on either side or on the rear of the truck in any desired location and takes a space of only 7 inches under the truck bed when folded. Although it is locked firmly in use position, it releases itself and folds back under the truck if backed into an obstacle. It is easily and quickly installed with only four 1/2-in. carriage bolts and blocking.

Collins Associates, Inc., National Sales Representatives, 3318 Glenmore Ave., Cincinnati 11, Ohio.

Circle No. 12-31 on the convenient reply card facing page 34.

## Electric Plant

Two standard series of Onan portable electric generating plants are now equipped with "Idle-Matic," a newly-developed speed control device, claimed to provide important economy of operation by reducing both engine wear and fuel and oil consumption. Conversion kits, to equip units in the field with Idle-Matic control, are available. Both series of controlled models are powered by single-cylinder, air-cooled Onan engines with all-weather generators directly connected to



the engine for positive, permanent alignment.

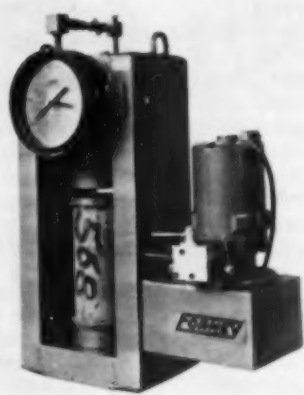
Onan Division of Studebaker-Packard Corp., Minneapolis, Minn.  
Circle No. 12-32 on the convenient reply card facing page 34.

## Compression Tester

The Model FT-30, a power-operated portable compression machine with variable speed of loading, embodies a rapid traverse which permits fast preloading of the specimen. The speed at which a specimen is loaded can be pre-set according to the applicable ASTM or AASHTO specification, and if desired, can be varied while the test is in progress. The speed of loading is maintained exactly without variation.

Forney's Inc., Tester Div., P. O. Box 310, New Castle, Pa.

Circle No. 12-33 on the convenient reply card facing page 34.



## NEWS OF ENGINEERS

HARLAND BARTHOLOMEW & ASSOCIATES have established an office in Memphis, Tenn., under the resident direction of W. S. Pollard, Jr., a partner of the firm.

L. WILLIAM WOOD has been elected vice-president of Johannessen & Girard, consulting engineers of Phoenix, Ariz.

PAUL N. KYDD has been elected vice-president and general manager of the Palos Verdes Water Co., California.

DR. EDWARD H. BRYAN, formerly of Dow Chemical Co., has joined the faculty of Duke University as an Associate Professor of civil engineering.

DONALD M. BAKER, long-time and well-known consulting engineer, Los Angeles, Calif., died Oct. 1.

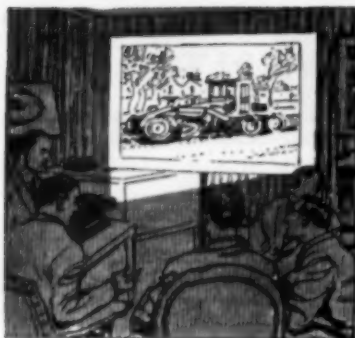
HENRY LIEBMAN director of operations, Department of Sanitation, New York City, who spent some time in Japan advising the Tokyo Metropolitan Government in respect to sanitation problems, has returned to New York.

BERNAL H. SWAB, well-known sanitary engineer has become associated with Camp, Dresser & McKee, consulting engineers of Boston. RALPH E. LEFFEL, retired Colonel, Corps of Engineers, has also joined the staff.

A citation has been presented to the Mayor and Council and the City Manager of Asbury Park, N. J., by the Asbury Park Area Chamber of Commerce. Each member of the Council and the City Manager, KENDALL H. LEE, received a framed scroll and the city was presented with a bronze plaque.

W. FRED WELSCH, since 1938 Senior Hydraulic Engineer in charge of the Division of Sanitation and Water Supply for Nassau County, N. Y., has opened an office in Albertson, L. I., N. Y., as an engineering consultant.

O. A. MOCKRIDGE, JR., has formed the firm of Mockridge Associates, consulting engineers, specializing in solids-liquids separation, with special emphasis on all types of filtration. Offices are at 460 Bloomfield Ave., Montclair, N. J.



## FILMS in Brief

Listed below are motion picture films of current interest to engineers, administrators and supervisors in the public works field. The companies providing these films have indicated that the films are available for appropriate use by PUBLIC WORKS readers. Requests for films should be made direct to the company listed with the film.

**"Headline for Harper."** Highlighting 50 years of public works progress in the United States through the career of fictional James E. Harper, Chief Engineer, Department of Public Works. (30 min., color, sound, 16 mm.) Consumer Relations Department, International Harvester Company, 180 North Michigan Avenue, Chicago 1, Illinois.

**"The Whole Story."** Methods of tunneling for small diameter spiral welded pipe under railroads or highways without traffic interruption. (25 min., color, sound.) Armco Steel Corporation, Attn. E. E. Wilkinson, 703 Curtis Street, Middletown, Ohio.

**"Millions on the Move."** Presents story of America's traffic congestion problem and examples of how rapid transit, outlaying parking areas and modernized rail and bus facilities have stimulated traffic flow. (27 min., color, sound, 16 mm.) General Electric Company in care of local distribution center of Association Films, Inc., 347 Madison Avenue, New York 17, N. Y.

**"Proper Rolling of Asphalt Pavements."** A training film for engineers and paving crews which describes and illustrates the recommended method of compacting an asphalt pavement to assure optimum performance under modern traffic. (10

min., color, sound, 16 mm.) The Asphalt Institute, University of Maryland, College Park, Maryland.

**"Only A Gasket."** Methods of manufacture and types of uses of various metallic and asbestos metal gaskets. (30 min., color, sound, 16 mm.) Motion Picture Department, Johns-Manville Corporation, 22 East 40th Street, New York 16, N. Y.

**"The Pump With A New Twist."** Drawings, cut-away and transparent models of the Wemco Torque-Flow pump and on-the-job scenes in applications including sanitation and waste disposal. (23 min., color, 16 mm.) Sales Promotion Department, Wemco Division of Western Machinery Co., 650 Fifth Street, San Francisco 7, California.

**"How Our Town Saved the River."** Keys to successful public bond issue campaigns for water pollution control facilities illustrated in scenes of typical city council hearing. Pre-election promotion efforts, successful election and construction scenes are shown. (30 min., color, sound, 16 mm.) Local district office of Portland Cement Association.

**"Fundamentals of Manual Shielded Arc Welding Techniques."** The four basic principles of arc welding—current setting, speed of travel, length of arc and angle of electrode are graphically explained in this operator-training film. (45 min., color, sound, 16 mm.) Air Reduction Sales Company. A Division of Air Reduction Co., Inc., 150 East 42nd St., New York 17, N. Y.

**"A New Approach to Grade Separation."** The use of Armco products in locations where grade separation is a problem. (17 min., color, sound.) Armco Steel Corporation, Attn. E. E. Wilkinson, 703 Curtis Street, Middletown, Ohio.

**"Cement-Treated Subbase for Concrete Pavement."** The various methods used to construct cement-treated subbases, the use of cement-treated subbase on a slip-form paving project and the techniques used to finish the subbase to accurate grade and crown. (11 min., color, sound, 16 mm.) Local district office of Portland Cement Association.

**"Skylines."** The revolutionary development of structural steel in the age of skyscrapers and giant bridges. (29 min., color, sound, 16 mm.) Bethlehem Steel Company care of local branch of Modern Talking Picture Service, 21 W. 60th St., New York 23, N. Y.

## CLASSIFIED

### WATER CHEMIST

Salary open. New position, allows individual to obtain necessary lab equipment and establish procedures to personal specifications. Initiative required. Administrative responsibilities available as supervisor of water treatment facilities.

### WATER ENGINEER

Salary \$600 to \$750. New position of supervisory, design and planning nature. California registration required, C.E., M.E., or E.E. or equivalent degree.

For further information on above two positions send resume to:

Contra Costa County Water District  
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### SEWAGE PLANT OPERATOR

We have a brand new sewage disposal plant. It is a primary plant to serve approximately 30,000 people. We need a qualified operator with at least a B-license in the State of Ohio. Remuneration based on your experience and in line with comparable positions. If you are interested in further information in regard to above position contact:

Lynn Plaisted  
Service Director  
City of Willoughby, Ohio

### BUILDING INSPECTOR

Capable of handling building and electrical inspections. Salary open and is dependent upon experience and qualifications of individual.

Apply to:

City Manager  
City Hall  
Iowa City, Iowa

### Experienced Highway Maintenance Superintendent Available

A young man with comprehensive experience in administration of highway maintenance program, including sewage and water treatment plants is available. Known to and recommended by the Associate Editor of PUBLIC WORKS, he offers a good record of experience, including extensive electrical work, and excellent references.

Write to Box 12-1  
PUBLIC WORKS Magazine  
200 South Broad St., Ridgewood, N. J.

### DIRECTOR OF PUBLIC WORKS

The City of Fort Pierce, Florida is accepting applications for the position of "Director of Public Works." This is supervisory work in directing the operations of the Public Works Department activities. Work involves responsibility for the organization, direction of activities for streets, drainage, sewer system, parks, garage and garbage and trash disposal. Applicants for this position must have considerable practical experience in municipal work. Age limit 30 to 45 years. Starting salary \$7,200 per annum with fringe benefits. Interview arranged on basis of letter stating qualifications, educational backgrounds, previous employment and compensation received. Send letter of application to:

Mr. Edward C. Peterson  
Personnel Officer  
City of Fort Pierce, Florida

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## WORTH SEEING

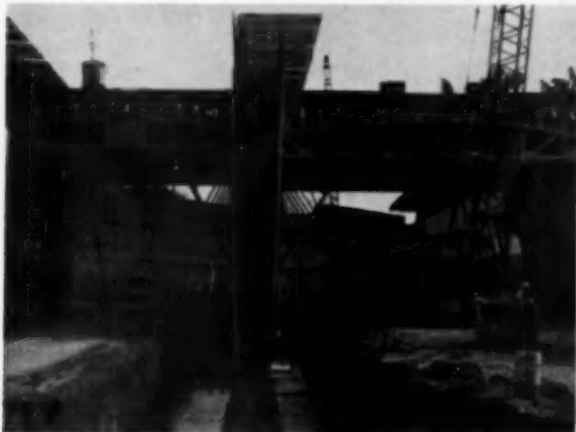


**Soft touch.** Low ground bearing pressures on a wide contact area are features that allow Terra-Tires to glide across the lawn without damaging a blade of grass. Specially suited for park and cemetery work, the tires are made by Goodyear.

**Caterpillar Traxcavator** replaces the traditional top-hatted dignitaries and beribboned shovel as ground is broken for addition to **PUBLIC WORKS'** offices. Present building, in attractive suburban location, was built in 1955. New wing will add 60 percent to floor space.



**Three-level grade separation**, part of the Northwest Expressway being built for Cook County (Ill.) Highway Department, was simplified by use of traveling steel forms specially designed by Blaw-Knox Co. to speed placement of concrete.



Just like a bird perched on a wire, this lineman safely grasps a high-voltage line. Bucket lining and occupant are energized by conductor; aerial boom of Holan truck-mounted unit is insulated.

**Swearing-in-ceremony**, as Thomas R. Komline, president of the Komline-Sanderson Engineering Corp., becomes Assistant Director for Mobilization Planning, Water & Sewerage Industry, B&DS, U. S. Department of Commerce.





**TWO PIECE**  
sliding or screw type cast iron valve boxes for covering 4" thru 10" valves for water or gas. Rugged construction for lifetime service. 5 1/4" shaft. Extensions as required.

*Adjustable*  
**VALVE BOXES**  
**THREE PIECE**

valve boxes supplied with separate bases are available in sliding or screw type. Made with 5 1/4" and 7" shafts with extensions as required. Complete line of service and roadway boxes.

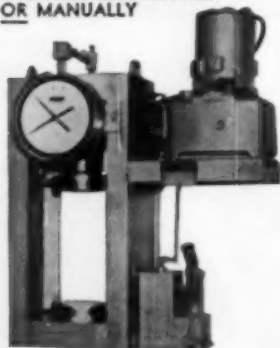
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General Sales Offices ANNISTON, ALABAMA

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350 Fifth Ave., New York 1, N.Y.  
950 Dirks Building, Kansas City, Missouri  
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- CONFORMS TO ASTM STANDARDS
- OPERATES ELECTRICALLY OR MANUALLY



- PERMANENTLY MOUNTED ELECTRIC PUMP
- 250,000 LB. LOAD RATING FOR CYLINDERS, CORES, BLOCKS, BEAMS, CUBES, BRICK AND DRAIN TILES

**FORNEY'S, INC.**  
TESTER DIVISION • BOX 310  
NEW CASTLE, PA., U. S. A.



by Arthur K. Akers

★ With summer scarcely ended, we find ourselves wishing you a Merry Christmas! Which we do, wholeheartedly even if well in advance.

★ Wain-Roy Corporation, Fitchburg, and Hubbardston, Mass., purchases all stock of A. C. Anderson, Inc., of Wildwood, N. J. Wain-Roy thus adds the Anderson loaders, bulldozers and mowers to its previous backhoe line.

★ A. M. Byers Co., Pittsburgh, will now market steel pipe also, nationally.

★ Kenneth O. Hodgson joins R. D. Wood Co. as New England sales representative, with headquarters in Newtonville, New York.

★ John A. Haaker is named general manager, Mobil Sweeper Division, The Conveyor Co., Los Angeles.

★ Burde-Perron Associates open offices in Paramus, N. J., as sales representatives for Walker Process Equipment, including Spencer Turbine Blowers; Tex-Vit packaged pump stations, and Nichols sludge concentrator. Spencer blowers sales are now exclusively handled by Walker Process.

★ Edward C. Ross is upped to advertising manager, B-I-F Industries, Providence, succeeding Charles J. Brex Jr., promoted to director of public relations.

★ Lloyd A. Rager appointed manager of newly established Products Marketing Department, LeTourneau-Westinghouse Co., Peoria, Ill. Formerly product manager, Motor Grader Division.

★ Chicago Bridge & Iron Co. names William M. Freeman New York district sales manager.

★ James B. Clow & Sons, Chicago, buys Streater (Ill.) Drain Tile Co., producers of sewer pipe and other clay products. \$2,500,000 was involved.

★ Henry C. French is promoted to chief engineer, Dempster Brothers of Knoxville, Tenn., manufacturers of the Dempster-Dumpster Systems.



Mr. French



Mr. Nelson

★ C. E. Nelson Jr. succeeds James E. DeLong, retired, as president Waukesha Motor Co., makers of heavy-duty engines.

★ A. M. Byers Co., Pittsburgh, appoints Joseph Smith advertising manager.

★ Andrew S. Thomas elected vice president in charge of new product development, The Jaeger Machine Co., Columbus, Ohio, manufacturers of highway equipment.

★ J. I. Case Co., Racine, Wis., names A. Earl Lee (formerly with Massey-Ferguson) as vice-president, marketing. It also opens a new branch in St. Paul, replacing the Minneapolis one.

★ Paul D. Miller becomes sales manager, Government Contracts, for The Heil Co.

★ Buffalo-Springfield Co. division of Koehring Co. promotes J. H. (Jack) Allen to vice-president, sales; and Glen E. Moore to assistant general sales manager.

★ United States Motors' northeastern sales will now be handled by Packaged Industrial Power Inc., Jersey City 6, under management of Albert H. Dyott.

★ Nobody can make a fool out of you without considerable assistance on your part.

—Wisty Martin Farrell



# FORE!

## **"Golf Ball on a Tee"**

**provides gravity pressure  
water storage**

Golfers touring the Oaks Country Club course at Oakhurst, Oklahoma for the first time seldom fail to comment on this striking landmark. It appears to be a giant golf ball perched atop a huge yellow tee.

In reality, it is a CB&I Watersphere. Built for the Tulsa Metropolitan Water Authority, the structure has a capacity of 125,000 gallons and is 97 feet to bottom.

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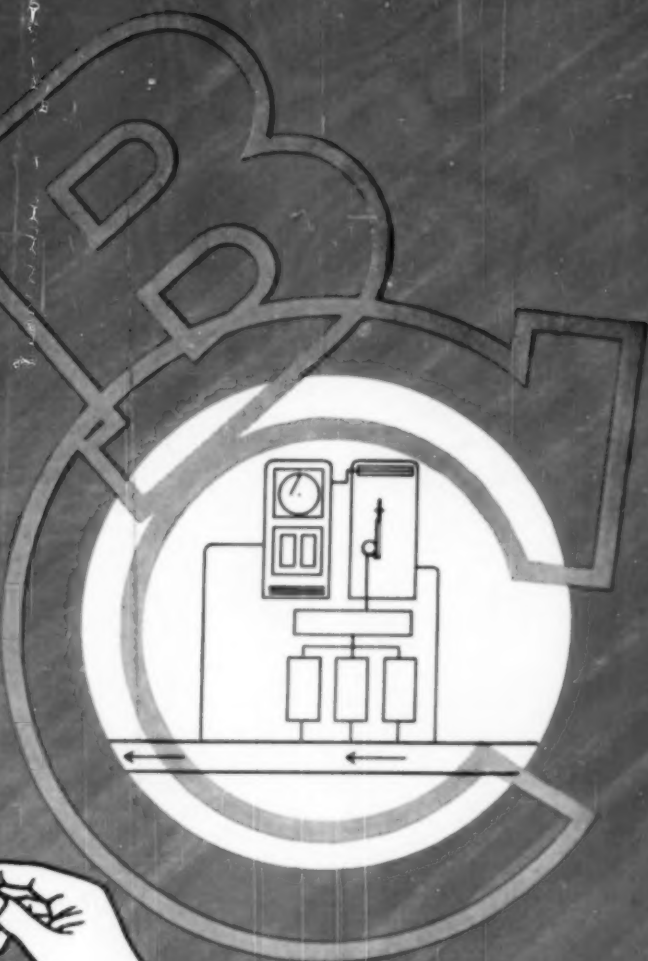
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Remote recording by W&T gives you duplicate residual records and minute-to-minute information where it helps guide operation. Remote controlling by W&T lets you adjust a chlorinator miles away. And W&T Remote Components adapt to almost any system, any type of control.

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*For more information, write Dept. S-142.78*



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